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THE ALBERTA JOURNAL OF EDUCATIONAL RESEARCH

VOLUME XXIX NUMBER 1 MARCH 1983

PUBLISHED BY
THE UNIVERSITY OF ALBERTA • EDMONTON

The University of Alberta
75th Anniversary
1982-83

THE ALBERTA JOURNAL OF EDUCATIONAL RESEARCH

A quarterly journal devoted to the dissemination, criticism, interpretation and encouragement of all forms of systematic enquiry into education and fields related to or associated with education.

Published quarterly in March, June, September, December by the
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AJER gratefully acknowledges support from the Social Sciences and Humanities Research Council of Canada and from the Alberta Advisory Committee for Educational Studies.

AJER is indexed in the *Canadian Education Index, Current Contents/Social and Behavioral Sciences,* and *Social Science Citation Index;* appropriate articles are abstracted in *Educational Administration Abstracts, Psychological Abstracts, Sociology of Education Abstracts, and Language Behavior Abstracts.*

The subscription rate is $12.00 per year; single copies are $3.50 each. Please make cheques payable to *The Alberta Journal of Educational Research.* All back issues are available; rates supplied on request. Claims for undelivered copies must be received within three months of publication.

Address all communications and manuscript submissions to the Editor, *The Alberta Journal of Educational Research,* Faculty of Education, 845 Education South, The University of Alberta, Edmonton, Canada, T6G 2G5.

SECOND CLASS MAIL REGISTRATION NUMBER 1436

ISSN 0002-4805

The Alberta Journal of Educational Research

Volume XXIX, Number 1 *March, 1983*

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FACULTY OF EDUCATION
The University of Alberta

Editor's Message

Readers will note that there are some changes in the list of consulting editors with this issue.

After serving for a period of four years, the following scholars have retired from their duties as consulting editors of AJER:

James Britton
John Calam
K. DeClerck
Rupert N. Evans
Grant Harman
S. Hunka
D.A. MacIver

They have been replaced by the following, whose institutional affiliation and research interests are included.

David C. Bjorkquist, Professor and Head, Division of Industrial Education, *University of Minnesota*, Minneapolis; the preparation of teachers for vocational and industrial education, computer applications in teacher education.

Peter E. Bryant, Professor of Psychology, Department of Experimental Psychology, University of Oxford; developmental psychology with Piagetian background, cognitive processing in students.

André Côté, Professor and Chairman, Department of Psychopedagogy, Faculty of Education, University of Ottawa; cognitive psychology and Piagetian theory as it applies to education.

Donald Fitzgerald, Professor and Head, Centre for Behavioural Studies in Education, The University of New England, Armidale; the development of psychometric models of individual differences in cognitive processing, laboratory and school-based studies of the interaction between patterns of instruction, and the provision of educational services in areas of special need using computer and communication technology.

Keith Watson, Professor, University of Reading School of Education; comparative and international education including third world matters, multicultural education, educational administration, and community education.

The wide ranging research interests of these new members make it possible for them to provide essential advice in the process of manuscript assessment. At the same time they serve as a panel to consider general matters which relate to the production of the journal.

To those who are retiring, I wish to express my sincere appreciation for the time and energy they have given to A.J.E.R. over the past three years. The former editor, Dr. Henry W. Hodysh, and I are indeed indebted to them.

I wish to welcome the new group of Consulting Editors and extend the wish that their term of appointment will be challenging and satisfying.

Doyal Nelson

The Alberta Journal of Educational Research *Vol. XXIX, No. 1, March, 1983, 1-14*

MILTON E. MARCH
Narrabundah College, Australia

and

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The University of Alberta

Dynamics of Control over Educational Decisions

In a questionnaire survey superintendents of schools in British Columbia, Alberta, Saskatchewan and Manitoba reported their perceptions of the degree of control exercised by each of five decision levels — department of education, school board, superintendent's office, principal, and teachers — over 32 decision items. Three perceptions were sought: degree of control at the time of data collection in 1980, a recollection of the situation in 1975, and a projection of the control likely to be exercised in 1985. Results of the analysis confirmed that, in the views of superintendents, changes in the locus of control over various items had occurred from 1975 to 1980 and further changes were projected for the period from 1980 to 1985. In general, the changes reflect a gradual yet continuing growth of influence on the part of teachers and principals but no dramatic change in the pattern of control over educational decisions. An examination of factors which influence the locus of control indicated that the centralizing forces were expected to strengthen and the decentralizing forces to diminish in the period from 1980 to 1985. This represents a reversal from the situation which prevailed in the period from 1975 to 1980. If the perceptions of the respondents are accurate, then the growth in influence over educational decisions at the school level may be reaching a plateau in the systems included in the survey.

Dr. March (PhD, University of Alberta) is Principal of Narrabundah College, Kingston, A.C.T. He has been involved in designing the structures and procedures for assessment of senior students in the Territory, and from 1974, chaired the Curriculum Working Party which helped formulate the style of the present curricula for the A.C.T. School Authority. In recognition of his services to education, Dr. March was awarded the Queen's Silver Jubilee Medal in 1977 and, in 1981, he was made a Member of the Order of the British Empire.

Dr. Miklos (PhD, University of Alberta) has served as teacher and principal in schools and has been with the Department of Educational Administration at the University of Alberta since 1962. His main teaching and research interests are in the general area of administrative processes in educational organizations. Dr. Miklos has recently been awarded a McCalla Research Professorship for 1982-83.

Changing circumstances are contributing to a heightened awareness of the substance of educational decisions and of the process through which those decisions are made. The issues which command the attention of decision makers at all administrative levels are both familiar and numerous: meeting the needs of an increasingly diverse clientele, ensuring the quality of educational programs, responding to public criticism, allocating resources effectively, and using facilities efficiently, to name but a few. Not only is there no shortage of proposed solutions to persistent problems but there seem to be ever more actors who wish to become involved in decision making or to exercise some influence over the process. Indeed, a central question of philosophical, political and practical significance is "Who should control the decision processes in education?" While that is the fundamental question, this paper is focused on a more modest topic, specifically, on the control actually being exercised at provincial, district and school levels over selected educational decisions. Although a description of where control resides will not tell us where it ought to reside, still the information may prove helpful to those who desire to understand educational decision making either as a base for action or for further research.

Perspective

Control Over Decisions

Control over decision making in education appears to be dynamic, not static. The shifting, fluid nature of control is reflected in the observation of several commentators. Not only is there agreement among them that changes in locus of control over specific decisions have taken place and are taking place, but, even more, differences in emphasis between analyses would seem to confirm the fact of changes over time. A few years ago Peter Coleman (1977) observed that there had been a wider diffusion of power through provincial systems of education in Canada. Among factors contributing to this shift was the rising professionalism, together with increasingly militant attitudes, of teachers generally. In his view the groups which had experienced net losses of power included provincial governments, trustees and administrators while net gains were enjoyed by teachers, teachers' associations, special interest groups, parents, and, to a lesser extent, students. Looking ahead, Coleman (1977) suggested that in the long run participation and responsiveness would decline, while in the short run decision making would likely take place in an atmosphere of conflict rather than of cooperation.

Other commentators would seem to agree with the observation that there has been a period of power diffusion in education. According to Farquhar (1980), the decentralization period covered about a decade beginning in the mid-1960s and was reflected in moves such as the elimination of province-wide examinations and replacement of provincially-appointed inspectors with locally employed superintendents. He suggested that the trend has been reversed and that now there are indications of a move toward re-centralization. This analysis finds support in the views of Williams and Powell (1980) who identify a number of indicators of a shift in control over crucial decisions from school districts to the provincial level. Among these are limits on budgets, control over teacher negotiations, more prescriptive curriculum guides, and increased involvement in the evaluation of students.

As further indication that "control is shifting slowly to the centre," Williams and Powell (1980, p. 48) point to the tendency of organized groups representing

the public, teachers, or trustees to concentrate their activities at the provincial level. One possible explanation for this shift is the apparent readiness of provincial departments of education to become involved when local agencies seem to be immobilized.

Emphasizing only the centralizing aspects probably would not describe adequately all shifts in the locus of control over educational decisions; decentralization and centralization may occur simultaneously (Miklos, 1974). The introduction of school-based budgeting gives professional personnel at the school level increased control over certain decisions, while the community school concept and parent advisory committees provide the public with new opportunities for "grass-roots" involvement in educational decision making. These shifts may not always take place in a climate of cooperation and harmony. As Williams and Powell (1980) note, public involvement in the form of organized interest groups may threaten the autonomy of educators; such groups may reduce the control exercised by professional administrators when they gain access to school boards.

The activities of organized interest groups may further exacerbate a condition which Farquhar (1980, p. 6) described as "a lack of visible, forceful professional leadership in Canadian education." Although chief executive officers may be regarded as leaders, their impact is, by the nature of the position, restricted to the local level and may be reduced even further if decision making becomes more politicized. A situation in which "No individual or group can claim to be 'in charge' "(Farquhar, 1980, p. 6) is a situation in which control over decision making is problematic.

Related Research

Most of the research on control over educational decisions has been focused on involvement in decision making at school and school district levels. Particular attention has been given to preferences for various decision modes, to discrepancies between actual and preferred degrees of involvement by different groups, and to variations in perceptions about decision making of persons in different educational positions.

In a study which is typical of those conducted in this general area, Simpkins (1968) investigated the actual and desired levels of participation of Alberta teachers in four decision areas: curriculum planning and adaptation, classroom management, arrangement of instructional program, and general school organization. Results indicated that teachers exercised most control over classroom management decisions and desired higher levels of involvement in the other three areas. The desire for increased participation was confirmed in a study conducted by Clarke (1970); however, his results suggested that the key element in the expectations of teachers was increased involvement rather than total control over any area of decision making. Similarly, results of a study by Knoop and O'Reilly (1977) suggested that teachers desire a decreased emphasis on principals as sole decision makers and a preference for increased use of group procedures in school level decision making.

Whether or not the desired changes actually have occurred may be influenced, in part, by differences in perceptions and beliefs between those who control the decision process and those who seek involvement. A number of studies have reported discrepancies between teachers' and principals' views. For example, Corriveau (1969) found that a sample of Quebec teachers preferred more

participation than principals thought they should have. Although results obtained by Louden (1980) in an Alberta study indicated that most decision making was participative and that principals perceived teachers to be satisfied with the level of teacher involvement, many teachers expressed a preference for increased involvement.

In one of the few studies which has examined decision levels other than the school, McBeath (1969) obtained perceptions of teachers in Saskatchewan on decision making about such aspects of educational programs as curriculum, goals and objectives, instruction, and evaluation. Five decision making levels were considered: classroom, school, school system, provincial, and national. Teachers perceived that most of the decisions about programs were made at the provincial level and that the least number were made at the school level. Whether this has changed somewhat in recent years as a result of pressures from teachers for increased involvement remains an open question.

Although studies such as those which have been reviewed have provided useful information about control over educational decisions, some gaps in the research are apparent. One of these relates to analyzing control over specific decisions at various levels of the educational system; another concerns possible changes in locus of control in response to various professional, administrative and environmental factors.

Research Problem

A number of research questions are suggested by current issues and previous studies: Who controls the decisions which have an impact on the operations of schools? What changes have taken place in control over these decisions? What changes are likely to take place in the future? What factors will have an impact on changes in the locus of control? These questions were the main focus of a recent study (March 1981a) on control over educational decisions. This paper is based on some of the results presented in that report.

Design of the Study

The basic approach taken in the study was a questionnaire survey of individuals who served as school district superintendents or directors of education in British Columbia, Alberta, Saskatchewan, and Manitoba. School superintendents and directors of education were selected as the respondent group on the assumption that officers at that level were best situated to have an overview of the decision process. Furthermore, it was also assumed that they were likely to have observed the changes which had taken place in recent years and, from their knowledge of forces at work, to be best able to predict changes which might occur in the near future. The four western provinces were chosen partly because of convenience and partly because of apparent similarities in their educational systems.

A list of decision items was initially developed from questionnaires used in studies such as those reported by Simpkins (1968), McBeath (1969), Corriveau (1969) and Knoop and O'Reilly (1977). Additional items were generated by the researcher in order to reflect recent developments in education; through a process of consolidation, 117 items were obtained from an initial list of about 200. The items were categorized under eight headings: finance and budgeting; capital expenditures; equipment, supplies and services; curriculum and instruction;

personnel management; pupil management; organizational structure; and community relations. Specific items related to such decision situations as allocating funds to a school from a school district, selecting a principal for a school, and determining the procedures for assessing student progress.

Four persons — two superintendents, one assistant superintendent, and one regional officer — were asked to rank order the items in terms of their relevance to decision making in the educational systems in the provinces included in the study. Five items from each of the eight categories were selected, and a group of respondents was asked to complete the questionnaire and to comment on the suitability of the items. Results of this pilot study suggested that a questionnaire of 40 items was longer than desirable.

As a result of the selection process and the pilot studies, the items finally selected satisfied the following criteria: (1) they reflected actual decisions on which some degree of control was exercised at various levels, and (2) they were representative of the eight areas of decision making. Limiting the length of the questionnaire to 32 items was deemed advisable in order to keep the demand on respondents within reasonable limits.

The questionnaire containing these items invited respondents to indicate their perceptions of the degree of control over each decision which was exercised by each of five levels: department of education, school board, superintendent's office, principal, and teacher(s). Three responses were required: impressions of the situation at the time of data collection in the spring of 1980; recollections of the situation as it existed in 1975; and predictions for the situation in 1985. A five-point response scale ranging from negligible degree of control (1) to a high degree of control (5) was used.

Respondents were also asked for their perceptions of the effect which each of eleven factors had on the locus of control over educational decisions. These eleven factors were as follows: general economic climate; social climate; political climate; pressure from teachers' associations; school board policy; department of education policy; pressure from trustees' associations; teachers' drive for professional status; current practices in administration; calls for public accountability; and superintendents' personal philosophy. Response alternatives ranged over a five-point scale from "strong centralizing influence" through neutral to "strong decentralizing influence."

Questionnaires were distributed to all superintendents or directors of education in the four western provinces as listed in the 1980 *CEA Handbook*. Preliminary letters requesting cooperation and follow-up letters to nonrespondents were used in an attempt to improve the response rate. In total 278 persons were contacted, and replies were received from 178. Six responses did not contain sufficient information; as a result, 172 or about 62 percent of those originally contacted were included in the data analysis.

The major approach to data analysis was the comparison of mean scores for individual items for the various subgroups of respondents: the total group, provincial subgroups, jurisdiction type subgroups, and year (1975, 1980, or 1985). Since the target group was the entire population of superintendents in the four western provinces, reliance on statistical tests of significance was not strictly appropriate; furthermore, heed was taken of the caution expressed by Cormier (1971) of the need to distinguish between "significant" and "important" differences. Nevertheless, tests of significance were used as guides when choosing

a value which might be considered as substantial for the difference between any pair of measures.

Results

When the superintendents' perceptions of the degree of control over the 32 educational decisions were analyzed, the main control for the large majority of items was found to be distributed among the school board, the superintendent's office, and the school principal levels. Teachers held the highest degree of control for only one item, that which was associated with awarding final marks or grades in high school subjects. The department of education held the highest degree of control for only two items: selecting textbooks for a particular subject and determining the broad outline of the curriculum.

Neither the superintendent's office nor the principal was perceived to have the lowest degree of control over any item; however, this was the case for the school board with respect to three items which related to curriculum, textbooks, and final grades. The board's main areas of control appeared to be in matters involving funding. The principal had most control over internal school matters, especially those associated with students. Many of the matters over which the superintendent's office had the highest degree of control were of an administrative nature. A full discussion of these and related results has been reported by March (1981b) in *The Canadian Administrator.*

The analysis on which this report is based focused on responses to 32 individual decision items by the total group of respondents for two time periods: 1975 to 1980 and 1980 to 1985. Three research questions were addressed:

1. What changes in control over educational decisions have occurred, or are projected to occur, at each decision level?

2. In what decision areas do these changes affect the pattern of control across the five levels?

3. What factors have influenced past or projected changes in control over educational decisions?

Results of the analysis for each question are presented in the sections which follow.

Changes in Degree of Control

Changes in the locus of decision making are subtle, complex, and difficult to document; however, some indication of general shifts may be obtained by simply comparing the number of decision items over which control at a particular level increased with the number of items over which control decreased during a particular period of time. A comparison of such changes for each of five organizational levels is presented in Table 1.

The data, based on superintendents' perceptions, indicate that from 1975 to 1980 the department of education experienced fewer total changes than did the other levels; for the changes that did occur, the number of items over which control decreased (6) was greater than the number over which control increased (3). Only the school board level experienced a similar decrease but this was offset

by an increase in control over nearly twice as many decision items (11). Superintendents increased their control over one-half of the 32 items included in the list while principals and teachers enjoyed increases on nearly all of the items.

TABLE 1

NUMBER OF ITEMS INVOLVED IN CHANGES IN CONTROL AT FIVE DECISION LEVELS

Level	1975-1980		1980-1985	
	Decrease	Increase	Decrease	Increase
Education Department	6	3	4	7
School Board	6	11	5	7
Superintendent	1	16	3	6
Principal	0	30	0	25
Teachers	0	31	0	29

Note: The maximum number of changes, decreases and increases combined, at each level in each time period is 32.

Further increases in control were projected for teachers and principals in the period from 1980 to 1985. All other levels were expected to increase their control over more items than the number for which control would be decreased; however, relatively few items are involved in these changes at any particular level.

The general pattern of change which emerges is one of increasing control over a broad range of decision items at the level of the school and classroom for the ten-year period. At the level of the school district — school board and superintendent — the net change is in the direction of increased control with some decreases in specific areas. At the level of the department of education, there would seem to be little change in areas of control; only a few items are involved, and increases appear to be balanced by decreases.

An examination of individual items was carried out to determine the decision areas in which changes in the locus of control had taken place or were projected to take place. Since principals and teachers were perceived by respondents as increasing their control over a broad range of decision items without experiencing any decreases, only the other three levels of decision making — department of education, school board, and superintendent's office — are of particular interest.

Some patterns were evident in the changes in control exercised by the department of education over the ten-year period. A decrease in control over the design of school buildings which began in the first period was projected to continue into the second; however, community use of buildings was expected to come under increased control. Decreased control by the department over selecting textbooks was perceived and projected for the full ten-year interval. A decrease in control was perceived as well in determining the number of teachers needed by a school.

There are a number of interesting reversals during the second as compared to the first five-year period. For example, a decrease in control over setting minimum and maximum class sizes from 1975 to 1980 was likely to be offset by increased control over these decisions in the second period. Similarly, decreased control over final grades in high school subjects was likely to be reversed in 1980-85. Indeed, an increase in control over a number of decision items was projected by respondents in the assessment area including procedures for assessing student progress, deciding reporting procedures, publicizing test results, and determining procedures for evaluating instruction. Increased control was anticipated also over education programs of a special or innovative nature.

The major areas in which decreased control by school boards was perceived or projected related to the management of physical facilities and finance at the school level; specific decisions involved allocating funds to schools, distributing those funds within schools, and selecting equipment and furnishings. Some decrease in control was also indicated in the personnel area, particularly in relation to selecting teachers and principals. School boards were perceived to be increasing their control over decisions relating to the evaluation function (both students and instruction), selecting textbooks, developing special educational programs, establishing school-community relations, determining school size, and several other operational matters.

Superintendents were perceived to have decreased their control over only one decision item during 1975 to 1980, namely, deciding on how funds allocated to a school are to be used. This decrease in control was projected to continue along with decreased control over selecting teachers and school furnishings. The decisions over which increased control by the superintendent's office was perceived or anticipated were distributed across all areas. Three of the specific items were associated with community relations while seven others involved various operational matters ranging from building construction to deciding on the staff complement for schools. Six items were of a general educational nature such as selecting textbooks, determining school programs and evaluating instruction. The projections for 1980-85 indicated that the degree of control would continue to increase over two community relations items and three operational items but that there would be no further increases in control over the educational items. Student conduct was the only other area expected to come under increased control from the office of the superintendent during this period.

Changes in Pattern of Control

The changes just described would seem to suggest that there has been a gradual transfer of control over many decision items to the school level. Testing this tentative conclusion requires an examination not only of the changes but also of the degree of control held by the various levels before and after the change. A comparison of the patterns of control — the rank order of the five levels in terms of degree of control exerted — before and after the changes revealed that these were affected for only 14 of the 32 decision items. Patterns of control for each of these items are presented in Table 2 for 1975, 1980 and 1985.

The first eight items in Table 2 are those which involved some increase in control over decisions by teachers. As is evident, the first four items are those over which they had the least control and had shifted, or were expected to shift, to second in rank order ahead of the department of education. On the next item

— parent advisory groups — teachers were projected to move from second to third rank order in degree of control. Only on two decision items — textbooks and in-school financing decisions — have teachers increased their control from second to fourth in rank order. They were projected to move from second lowest to second highest in one other area, namely, classroom furnishing decisions. These last two areas also involved some reduction in the degree of control exercised by superintendents and school boards.

TABLE 2

CHANGES IN PATTERNS OF CONTROL OVER DECISION ITEMS

Decision Item	1975	1980	1985
Funds to school	T D P S B	D T _ _ _	_ _ _ _ _
Special areas	T D P S B	D T _ _ _	_ _ _ _ _
Number of teachers	T D P S B	D T _ _ _	_ _ _ _ _
Finance special program	T D P S B	_ _ _ _ _	D T _ _ _
Parent groups	D T S B P	_ _ _ _ _	_ S T _ _
Textbooks	B T P S D	_ S _ T _	_ _ _ _ _
Finance in school	D T B S P	_ B S T _	_ _ _ _ _
Classroom Furnishings	D T S B P	_ _ B S _	_ B S T _
Major equipment	D T P S B	_ _ _ _ _	_ _ S B P
School program	T B D P S	_ D B _ _	_ _ _ S P
Field trips	D T P S B	_ _ _ _ _	_ _ S P _
Selecting principals	D P T S B	_ _ _ B S	_ _ _ _ _
Student transport	T P S D B	_ _ D S _	_ _ _ _ _
Lesson schedule	D B S T P	_ _ _ _ _	B D _ _ _

Note: Rank order is from lowest to highest degree of control exercised by the organizational levels: D = department of education; B = school board; S = superintendent's office; P = principal; T = teacher(s). A _ indicates no change from first column.

Changes in patterns of control for three decision items involved principals. In the opinion of the respondents, control by principals is likely to shift to highest in rank order in relation to equipment and school program decisions, and to second highest (following the school board) in decisions about field trips. These same decision items involved a reduction in the degree of control exercised by the superintendent.

The degree of control which superintendents have over selecting principals has increased in comparison with the board, while control over student transportation has increased over that previously exercised by the department of education. In

the opinion of the respondents, the department of education will exert somewhat more influence over one specific operational matter (lesson scheduling) while the degree of control exercised by the board was projected to decrease.

An analysis of these patterns of decision control indicates that although increases in control for teachers and principals were evident on a broad range of decision items, few of these increases resulted in changes in the pattern of rank orders of control exercised by the five levels. A possible explanation for this result is that the increased control by teachers and principals results from greater participation by these groups in decision making and from a more influential type of involvement which does not reduce the degree of control exercised by the other levels except in the few instances indicated.

Factors Influencing Changes

Respondents were asked to report their perceptions of the degree to which each of eleven factors influenced the locus of control over decisions. The eleven influences suggested by various sources in the literature included both environmental factors, such as the economic and political climates, and operational factors, such as school board policy and administrative practices. In Figure 1 the relative centralizing/decentralizing influence of the eleven factors is displayed graphically.

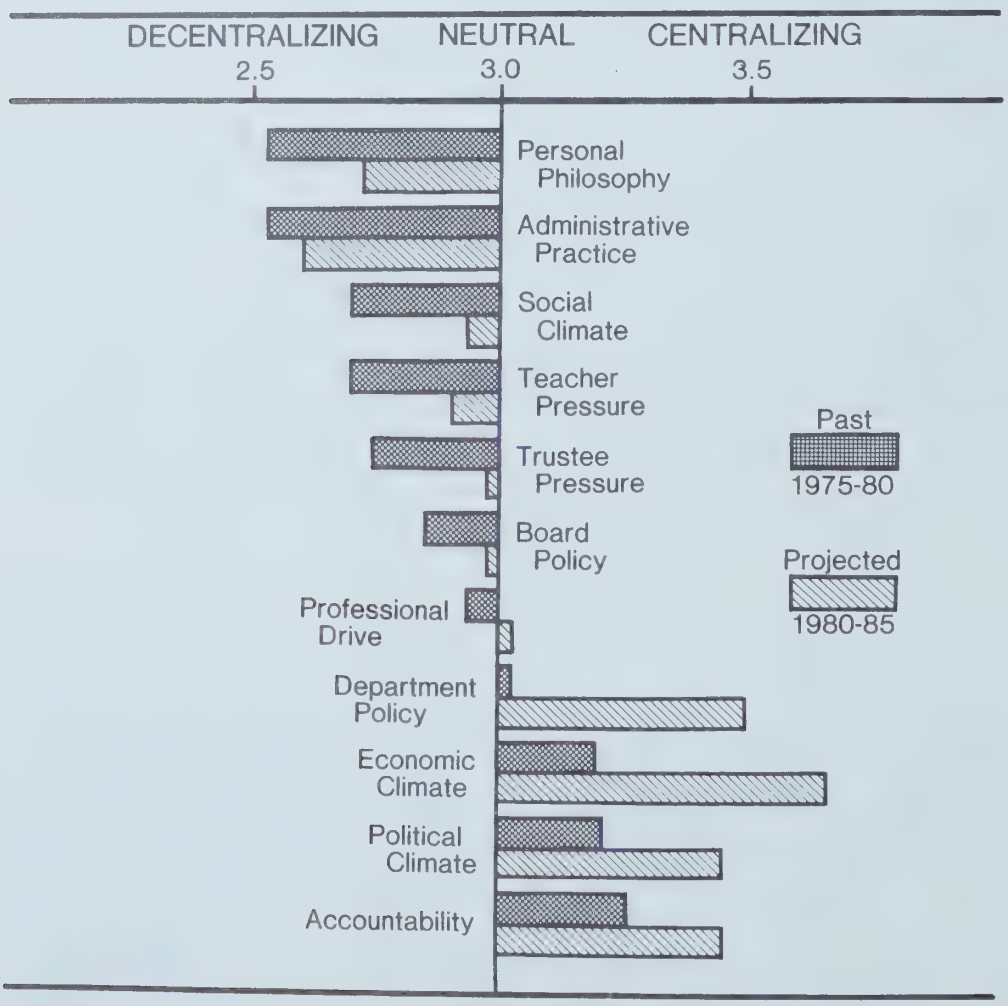

Figure 1. Relative strength of centralizing/decentralizing influences.

As is indicated by the bar graphs, the factors tend to fall into three broad clusters: those which consistently have a decentralizing influence, those which consistently have a centralizing influence, and those which have relatively little influence on the locus of control over decisions. Four factors were perceived as having a definite decentralizing influence from 1975 to 1980: the superintendent's personal philosophy, administrative practices, the social climate, and teacher pressure. A centralizing influence was perceived to be exerted by three factors during ths same period: the economic climate, the political climate, and calls for accountability. Little influence on the locus of control was attributed by superintendents to trustee pressure, board policy, drives for professional status, and policies of the department of education.

The same general influence was projected by the respondents to continue through 1985; however, some changes in the strengths of these factors are anticipated. In particular, the major decentralizing forces are expected to diminish while all centralizing forces are expected to increase in intensity. Changes in policies of the department of education and the changing economic climate appear to be particularly noteworthy. The sum total of these influences suggests that there has been a reversal from a situation which was favorable to decentralization to one which is more favorable to the centralization of decision making.

These results support a model which portrays the locus of decision making as being determined by the interplay of forces for centralization and forces for decentralization which coexist at any one time. Among the factors considered in this analysis, the major forces for decentralization would seem to be internal to school jurisdictions and of an ideological nature such as prevailing beliefs about the appropriate locus of control over various decisions. Forces which tend to favor centralization of decision making are external to the educational system such as the economic and political climates. A major factor which moderates the influences of these forces is department of education policy. When the external centralizing forces are in ascendance, as they seem to be at the present time, even the internal decentralizing forces seem to be modified to some extent; however, to the extent that local authorities have control over the locus of internal decisions, administrative practice can continue to favor decentralization, for a time at least, in spite of pressures for increased centralization at the upper levels of structure.

Conclusion

Results of the analysis confirmed that, in the opinions of the respondents, changes occurred in the degree of control exercised by different levels between 1975 and 1980, and that further changes were anticipated by 1985. Perhaps the most noteworthy feature of these changes is an apparent increase in the total amount of control being exercised over educational decisions — more levels are perceived to be exerting increased control over more decision items. Within this general context there seems to be a decentralizing trend in the sense that most decreases have occurred at the department and school board levels while most of the increases in control over decision items have occurred at the level of the superintendent's office, the principal and teachers. Although the department of education and school boards may have reduced control over some decision areas, there were indications of an increase in what might be termed "quality control" decisions, in particular, decisions relating to the assessment of students and educational programs.

Although there appear to be many changes in the degree of control exercised by various levels, these changes were of a relatively minor nature and usually did not alter the pattern of control over decisions in any significant way. Consequently, the general trend was not one of a major decentralizing shift of authority towards the school but rather of a gradual yet continuing growth of influence by both teachers and principals. Some of the increases in control by teachers have come in areas where they have traditionally had limited control, and this increase seems to be at the expense of the department of education. The changes are probably insignificant for the department but highly important for teachers. Also significant are indications that teachers have gained somewhat more control over decisions relating to the classroom and that principals, together with teachers, have gained more control over decisions affecting the school. In general, the examination of patterns of control supports the interpretation that the changes reflect the development of more participatory decision models, and delegation of responsibility accompanied by monitoring activities at higher levels rather than any dramatic change in the pattern of control.

An examination of the factors which are likely to influence changes in control over decisions suggests the probable simultaneous operation of both centralizing and decentralizing forces. The perceived greater effect of such decentralizing forces as the personal philosophy of administrators and administrative practice, particularly during the first five-year period, seems to be consistent with perceived increases in control exercised at the school level. There are clear indications of a more centralizing influence for the period 1980-85 when compared with 1975-80. Factors which were perceived to exert a decentralizing influence in the earlier period were predicted to decline in the projected five-year period while factors which have a centralizing influence — in particular, economic and political climates as well as department policy — were expected to increase in strength. If these perceptions of superintendents are accurate, the growth in influence of teachers and principals may be reaching a plateau.

In general, the results of the study provide support for some of the observations discussed in the earlier part of this paper. There is some support for Coleman's (1977) conclusion that teachers have enjoyed a net gain in control over decisions while the department of education and school boards have experienced net losses. Although a period of decentralization may not be followed by a dramatic reversal, the general trend described by Farquhar (1980) also is supported. If the centralizing forces do increase in intensity, they may clash with the aspirations of educators and with the trend toward increased control over decisions by lower levels of the organizational hierarchy. This observation serves to underline the predictions of Williams and Powell (1980) and of Coleman (1977) for increased conflict in the control over educational decision making. The challenge which this presents for all involved is to approach the conflict in a manner which places the political motives secondary to ensuring that the quality of decisions is not compromised.

In conclusion, some observations about the implications of the results for practicing educators and for researchers would seem to be in order. Those who would seek to influence control over decisions may find it helpful to note that there can be significant changes in control without disturbing the overall pattern of control; that is, changes in degree of control need not be threatening and disruptive. Furthermore, the direction of the changes is, at least to some extent, in the hands of educators themselves in the sense that some influential forces are

internal to the educational system. Whether or not these forces are actually operative would seem to be more a matter of will than of fate. For the researcher, there is every indication that changes will continue; in brief, that there will be something to study. The area promises to be one of continuing interest for both the practising administrator and the scholar.

The helpful comments of Eugene Ratsoy and John Bergen on an earlier draft of this paper are gratefully acknowledged.

References

Clarke, G. A. Teachers' perceptions of school decision making roles. Unpublished Master's thesis, Edmonton: The University of Alberta, 1970.

Coleman, P. Power diffusion in educational governance: Redefining the roles of trustees and administrators in Canadian education. In J. H. A. Wallin (Ed.), *The politics of Canadian education*, (C.S.S.E. Yearbook, Vol. 4). Edmonton: Canadian Society for the Study of Education, 1977).

Cormier, R. A. Of significant and important differences. *Alberta Journal of Educational Research*, 1971, *17*(1), 33-42.

Corriveau, R. L. A comparison of principals' and teachers' perceptions of the actual and preferred degree of teacher participation in a number of decisions. Unpublished Master's thesis, Edmonton: The University of Alberta, 1969.

Farquhar, R. H. Unique factors affecting Canadian education. In R. Farquhar & I. Housego (Eds.), *Canadian and comparative educational administration.* Vancouver: Centre for Continuing Education, University of British Columbia, 1980.

Knoop, R., & O'Reilly, R. R. Decision making procedures and teacher participation. *The Canadian Administrator*, 1977, *17*(3).

Louden, L. W. *Administrative decision making in schools.* Unpublished doctoral thesis, Edmonton: The University of Alberta, 1980.

March, M. E. *Variations in degree of control over educational decisions.* Unpublished doctoral thesis, Edmonton: The University of Alberta, 1981. (a)

March, M. E. Control over educational decisions. *The Canadian Administrator*, 1981, *21*(3). (b)

McBeath, A. G. *A survey of the perceptions of the levels of decision-making in educational programs in the elementary and secondary schools of Saskatchewan.* Unpublished doctoral thesis, Urbana: University of Illinois, 1969.

Miklos, E. Forces affecting the decentralization of decisions. In E. W. Ratsoy & D. M. Richards (Eds.), *Decentralized decision making in school districts.* Edmonton: Department of Educational Administration, The University of Alberta, 1974.

Simpkins, W. S. *The distribution of decision making authority in the school.* Unpublished doctoral thesis, Edmonton: the University of Alberta, 1968.

Williams, T. & Powell, M. J. Issues in Canadian educational administration. In R. Farquhar & I. Housego (Eds.), *Canadian and comparative educational administration.* Vancouver: Centre for Continuing Education, University of British Columbia, 1980.

The Alberta Journal of Educational Research *Vol. XXIX, No. 1, March, 1983, 15-30*

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Teacher Perspectives on the Teaching of Writing

From the ways in which 80 items dealing with the teaching of written composition were freely sorted by 93 teachers of year ten English from large, state high schools in Southeast Queensland, a seven-fold typology was obtained after applying a category-focusing version of Latent Partition Analysis, an Index of Similarity Analysis, an Hierarchical Grouping Analysis, and a Multiple Discriminant Analysis. The statistically derived viewpoints were then clinically inspected by comparing, group by group, the categorizations made by the 15 representative teachers with the 20 nuclear categories that were shared by the original sample of teachers. Fewer pedagogically than statistically significant differences were found. Since the seven perspectives seemed to converge and reflect a traditional rather than a progressive pedagogy, teacher education courses may have to follow the learner-centred strategies they advocate.

Modern mass societies are made up of a bewildering array of social worlds, and individuals live successively in many of them. The English teacher, for example, may also be a sailing enthusiast, an orchardist, or political party worker and thus lead a segmented kind of existence. However, even the cultural area of the teacher's professional life, the teaching of English, is also liable to cleavage. Divisions may form around differences in sex, age and experience, qualifications, and teaching paradigms. But no matter what viewpoints are adopted, teachers' occupational perspectives or personal construct systems represent those categories of thought in terms of which they attempt to grasp the nature of teaching. Smith and Geoffrey (1968, p. 96) argue that teaching must be seen as an intellectual, cognitive activity and that what goes on in the heads of teachers must be a critical antecedent of what they do.

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Educational controversies are particularly able to divide the teaching profession by promoting alternative paradigms or definitions of pedagogy. For example, while one colleague may champion the direct teaching of the skills and complain about an alleged decline in composition, another in the same staffroom may advocate simply letting pupils read, write, and talk as much as possible with a minimum of adult interference. A third teacher of writing becomes acutely aware of the existence of these different outlooks when caught up in situations where conflicting demands are made. The staffroom thus functions as an arena of legitimation or negotiation where contrasting views of teaching are fought for and opposed.

Separate sections of even such a small epistemic community as teachers of year ten English may conceive of the reality of teaching writing in terms of very different symbolic coordinates. Each segment may divide the reality conceptually in a different way. Kelly's theory of personal constructs suggests that people (or groups) differ in how they perceive and interpret a situation, in what they consider important about it, and in what they consider its implications; that is, "persons differ from each other in their construction of events" (Kelly, 1955, p. 55). Groups of teachers who share distinctive subsystems may construe together as "birds of a feather" and co-produce their own reality.

Review of Literature

A number of studies of teachers' different viewpoints have been made. For example, Combs and Soper (1963, p. 226) have found that it is possible to distinguish effective helping professionals on the basis of their richer perceptual organizations, while Runkel and Damrin (1961) report that student teachers who become the most effective teachers are those who make the most pronounced movement first from complex to simple, and finally from simple to complex viewing of children. They begin their teaching by using a large number of surface, irrelevant dimensions, then recognize a smaller number of important characteristics but end up employing more criteria that are situationally relevant.

Kerlinger (1958, 1967) has shown that two relatively orthogonal factors, "traditionalism" and "progressivism," seem to underlie teachers' attitudes towards education. Sontag (1968) used an 80-item Q-sort instead of a questionnaire in order to measure 80 American elementary and high school teachers' perceptions of desirable teacher behaviours. The items are concise statements that reflect teachers' classroom behaviours in the areas previously used by Kerlinger. The high school teachers' sort yields four factors: general subject matter, concern for students, structure and subject matter, and norms and rules. Most of the teachers rated as traditionalists load on the first factor and the progressives on the second.

Barnes and Shemilt (1974) have used sentence completion tasks to look at the ways 125 British secondary teachers differ in their tacit assumptions about the teaching of writing. The questions were deliberately vague so that in attributing meaning to them the respondents were compelled to use their own covert assumptions about writing. While it proved very difficult to categorize the replies, a significant factor called "Transmission-Interpretation" was found.

According to Barnes and Shemilt (1974, pp. 220-227), the Interpretation teacher sees writing as a means by which pupils can reshape their world-views. The teacher tries to ensure that students see the writing as relevant to their own purposes and as contributing to a dialogue in which they play a crucial part.

Therefore, the pupils' writing is given the status of wider publication, and is allowed to influence the direction of lessons. On the other hand, the Transmission teacher is primarily aware of writing as a means of measuring the pupils' performance against the teacher's own expectations and criteria. When setting written work, the teacher focuses upon the kind of writing that is wanted, assuming it is the teacher's business to define their task and then to provide students with feedback, indicating their success in measuring up to the teacher's standards. The writing is to be addressed to a general, disembodied reader rather than to the teacher or the students themselves. Finally, it is believed that it is the teacher's main responsibility to indicate errors and award grades.

Barker-Lunn (1970) and Ashton, Kneen, Davies and Holly (1975) have also found traditional and progressive groups among British primary school teachers. In their study of the effects of teaching style on British primary school pupils' progress, Bennett, Jordan, Long and Wade (1976) have identified three major teacher types as formal, mixed, and informal. Re-analysis of the data by Aitkin, Bennett and Hesketh (1981) confirms the existence of three distinguishable teaching styles. Three large scale American classroom investigations (Brophy & Evertson, 1974; Soar, 1973; and Stallings & Kaskowitz, 1974) have been made of two opposed pedagogies which they label direct instruction and flexible inquiry. Gray and Satterly (1981) have concluded that the formal-informal, traditional-progressive debate continues to represent one of the more popular ways of speculating on the effectiveness of teachers, regardless of the research difficulties.

Miller (1981) has found that, using educational statements as a basis, a typology of educational orientation and of educational theories could be constructed between the extremes of teacher and child-centredness. In the present study, the constructs that teachers have of teaching written composition are studied in order to determine whether or not they cluster into well differentiated viewpoints and to discuss their pedagogical as well as their statistical significance.

Procedure

A number of different techniques are available to measure teachers' ideas or constructs: sentence completion, in-depth interviewing, word association, Kelly's Repertory test, the Q-sort, the semantic differential, and a free object sort. Kelly's (1955, p. 145) electronic analogue of his information-processing model of thinking suggests that a sorting task is appropriate since it takes account of the process whereby, when people scan surrounding events, they "light up" certain of their categories or constructs. These systems represent kinds of scanning patterns which they continually project upon their world. As they sweep back and forth across a particular field, they pick up blips of meaning. The more adequate their scanning patterns, the more meaningful their world becomes.

A free-sort was seen as providing an observation method of enough structure to allow for quantification of the responses but without unduly influencing the form of the classifications. It was selected instead of a Repertory test for three reasons. First, the events to be construed were taken from the domain of the teaching of writing and consisted of teaching behaviours rather than relations with particular people. Second, a free-sort permits the teachers to generate only those relationships or constructs which they normally use themselves. Finally, 93 teachers rather than just a few individuals were being investigated.

The first step in the present study involved the generation of statements about the teaching of writing which the teachers could scan. These items were derived, not directly from interviewing teachers, but from a search of the most recent and relevant literature as contained in 33 widely used text and reference books, periodicals, and taxonomies of teaching. The procedure is regarded as valid since personal and provided elements have been shown to produce functionally equivalent measures for normal persons and supplied elements seem useful in studies involving group comparisons (see Diamond, 1980). Miller et al. (1967, p. 118) report that while it is extremely time consuming to interview even 30 teachers in order to generate items for sorting, comparable results are obtained by making a systematic selection of stimuli from the relevant literature. In the present study, the teachers themselves commented on the representative nature of the 80 statements. They claimed to have heard many of them previously from teacher educators, administrators, and other classroom teachers. The events seemed to relate directly to their teaching lives.

Rosenshine (1976, p. 338) has argued that two foci characterize all models of teaching behaviour. The first kind can be labelled behaviour-analytic, detail specific and structured. The learner proceeds through small, prescribed steps towards each goal. The other model can be described as inquiry-oriented and learner-centred. The learner has greater choice of the means to be employed toward reaching the goal. Rosenshine (1976, p. 340) asserts that these two are the dominant approaches to education: structured and direct instruction versus flexible inquiry. Accordingly, the skills-based and the growth-oriented pedagogies were used to guide the sampling of statements in an a priori fashion. For example, Items 26 and 63 correspond to a more traditional viewpoint:

> Learning to write is a conscious, mechanical skill learned in a progressive sequence of techniques for combining words into sentences, sentences into paragraphs and paragraphs into an essay. The teacher dispenses these rules, precepts and principles and the pupils learn by drill. (26)
>
> The teacher must control the topic to be written about and the way in which it may be written about; she alone must be the audience for whom her pupils write; she must set the length and time limits. All the pupil has to do is perform and then revise the indicated errors. (63)

In contrast, Items 5, 35 and 47 exemplify a more progressive construct system:

> As they mature, young people naturally learn to write. (5)
>
> Our pupils are essentially positive, creative beings and in their writing they can attain to creative insights valuable to themselves and others. (35)
>
> The chief concern of the English program is to enable the children to use their developing resources of language to explore their personal experiences. (47)

One hundred of these statements were pretested on a heterogeneous group of nine experienced and practising teachers of year ten English. From this pilot, 80 items emerged as being unambiguous and not too general. This sample size accorded with Kelly's recommendation of 20 to 30 rows or triads. In further support, Miller et al. (1967) found that, after allowing for training, no more than 120 statements could be sorted in two hours.

The 80 items were printed on cards (10 cm x 8 cm) and presented to a volunteer sample of the teachers of year ten English from 22 large, state high schools in Brisbane and Ipswich (Southeast Queensland). The sorting session was held with groups of no more than eight teachers at any one time. In all, 93 sorters were used and each of them was identified by means of a four-digit code number. Miller et al. (1976) have advised that stable base line data are obtained if a heterogeneous sample of at least 30 sorters is available.

After a training task involving the sorting of complex hexagons had been completed, each teacher was presented with the deck of 80 different cards. Each card was numbered with the corresponding number on the reverse side. The number was assigned strictly in an alphabetic fashion so that as few clues as possible were given for the classification. It was a free-sort in that the subjects were able to group the statements on whatever basis they thought appropriate, apart from agreement or disagreement. The instructions were as follows:

To form your groups please carry out the following directions ONE STEP AT A TIME:

1. READ and STUDY the first statement or card.

2. DECIDE what aspect of teaching writing this statement concerns.

3. WRITE a tentative outline of this idea on the first envelope, which you then number as ONE. This gives the group a name, so that for each group you will have a REASON for thinking its component statements go together, irrespective of whether you agree or disagree with them.

4. PUT the statement inside the NAMED envelope.

5. REPEAT steps 1-4 for each statement. If any NEW ITEM concerns the SAME aspect of teaching writing as one that you have previously sorted, PUT THE TWO together in the same envelope. IF not, begin a new group by writing a new, tentative title on another envelope and placing the statement inside it. NUMBER each envelope.

6. RESORTING. At anytime during the sorting task, you may come across a statement that does not seem to belong where you had previously placed it; you may do one of three things with it: EITHER (a) Place it in another group envelope where you think it now belongs, OR (b) Start a new group with it and name its envelope, OR (c) Mix it with the other statements not yet sorted.

7. REVIEW your groupings carefully when you have finished assigning all the 80 statements into categories. Review the ideas in each category with special concern for whether the statements seem to you to BELONG TOGETHER. You may make any changes you like by dividing, combining or switching the cards or statements. Even contradictory statements can be placed in the same group, providing that they deal with the same idea or topic.

8. CHECK finally to see that you have written a short phrase on EACH envelope used that you think best describes the central unifying IDEA that caused you to place the statements together. EACH envelope should be NUMBERED so that you can tell how many groups have formed and each of them can be identified. Remember, however, that as far as this project is concerned, there are NO right or wrong answers.

9. Remember that your groups can consist of DIFFERENT NUMBERS of statements; a group can consist of MANY OR FEW items.

10. Fifteen minutes before the end of the session you will be able to review your groupings.

PLEASE START. DO NOT HURRY AS YOU HAVE 80 MINUTES.

When another sample consisting of 11 teachers in their fourth year of professional preparation, together with two very experienced, well qualified, and promoted teachers of English, sorted the 80 items on two separate occasions, one month apart, the mean measure of self-agreement that resulted was .71, with a range of .56 to .85. Accordingly, the data-gathering procedure is regarded as sufficiently reliable.

Statistical Analysis and Results

When the teachers sorted the items, their individual subsets or groups were regarded as manifest categories or constructs. The statistical operation known as Latent Partition Analysis was applied in order to summarize the data and to make apparent the major similarities in all the teachers' categorizations. This technique identified empirically the set of categories that were presumed to be latent in the population of teachers being studied.

The program constructed a joint proportions matrix. This was an 80 x 80 matrix, A, where

$$a_{ij} = \frac{\text{number of subjects who placed items i and j together}}{\text{total number of subjects.}}$$

If a_{ij} was low (approximately zero), then very few teachers placed the two items in the same category. However, if a_{ij} was high (approximately unity) then most teachers grouped items i and j together. The matrix thus provided a measure of the relationship between each pair of items.

A principal factor analysis was next applied in order to discover the unrotated factors that existed in the previous proportions matrix together with the latent roots of the factors. Following suggestions made by Wiley (1967) and Evans (1970), those principal components with latent roots greater than unity were iterated to provide a principal factor solution. The principal factor coefficients formed the input for the final program to compute category probabilities and coefficients. In this way, the 20 nuclear categories or major ideas used by the teachers were identified. This set is presented in Table 1. It has been discussed by Diamond (1979) as representing teachers' conventional understandings and their implicit theory of teaching writing.

Since none of the categories has a probability of greater than .58 of being formed, it is clear that not all of the teachers used every construct to structure their thinking about the teaching of writing; that is, there is potential disagreement within the English teaching profession over very fundamental concepts at least at this level.

In order to identify in the greatest detail the distinctive viewpoints used to conceive of the teaching of writing, the categories formed by the 93 teachers were compared teacher by teacher to produce a similarity matrix. The measure, s, was

proposed by Evans (1979, pp. 389-391) as an index of similarity of categorization. It is defined as:

$$s = 1 - \frac{d}{\overline{d}_{max}}$$

Consider two categorizations of the same n stimuli, C_1 and C_2. The set C_1 has c_1 categories and C_2 has c_2 categories. Let f_{kj} be the number of elements of category j of C_1 also occurring in category k of C_2. Let F be the matrix of elements f_{kj} . As an example, if there are eight stimuli, and C_1 is the partitioning, 12/34/56/78, while C_2 is the partitioning, 1246/3578, then $c_1 = 4$, $c_2 = 2$, $n = 8$, and F would be the 2 x 4 matrix in Table 2 below.

TABLE 1

TEACHING WRITING: TWENTY CATEGORIES

No.	Title	Category Probability
I	Teacher-Student Relationship	.37
II	The Mechanical Skills	.51
III	Motivation	.27
IV	Feedback	.50
V	Difficulties in Writing	.37
VI	Developmental Writing Sequence	.29
VII	The Importance of Talk	.58
VIII	The Growth Model	.44
IX	The Deductive Teaching of Writing	.36
X	Writing Topics	.32
XI	Natural Development	.48
XII	Sense of Audience	.38
XIII	The Ideal Teacher of Writing	.43
XIV	Correctness versus Appropriateness	.48
XV	The Inductive Teaching of Writing	.25
XVI	The Best Writing	.36
XVII	Students' Positive and Creative Nature	.44
XVIII	Teacher Domination	.36
XIX	The Futility of Abstractions	.21
XX	Criticisms of Conventional Teaching of Writing	.45

TABLE 2

EXAMPLE OF F MATRIX

		C_1				
		1	2	3	4	d components
C_2	1	2	1	1	0	2
	2	0	1	1	2	2
d components		0	1	1	0	d = 6

Figure 1. Plot of Within group variance against Number of groups.

The F matrix is bordered by the individual components of d. These are merely the sums of all but the largest element of each row or column. In the above example, d = 6.

The value of d_{max} is given by:

$$d_{max} = n \left(\frac{2 - c_1 + c_2}{c_1 c_2} \right)$$

For the present example this has the value of 10, and s is .40. The similarity index, s, ranges from 0 representing no agreement to 1 representing complete agreement and is related to the "categoric similarity index" used by Triandis (1959) and the "index of colinearity" developed by Runkel (1956). In the present study, s was found to range from .16 to .60.

Though the similarity matrix for the 93 teachers suggested clusters of those teachers who formed similar groupings of the items, an Hierarchical (H) Grouping Analysis was undertaken in order to delineate these groups more clearly. This is a multivariate clustering technique that examines similarities between profiles and progressively groups the individuals so as to minimize an overall estimation of variation within clusters. In this study, the scores were provided by the coefficients contained in the previously formed intersubject similarity matrix.

The results of the H group analysis carried out on the 93 teachers' similarity proportions are shown graphically in Figure 1. The number of groups was plotted against potential error increase. The 93 teachers were taken as classified into seven groups since reduction from eight to seven groups produced a marginally greater increase in error than that associated with reduction from six to five groups. The classification check in Table 3 shows that none of the 17 teachers who were clustered into group 4 as a result of collapsing the original groups 6 and 8 would have been more accurately allocated to any of the six remaining groups.

A multiple discriminant analysis was performed to investigate further this sevenfold classification. The number of teachers classified into each of the seven groups after applying the discriminant model is compared in Table 3 with the original allocation by H Grouping.

TABLE 3

NUMBER OF TEACHERS CLASSIFIED INTO GROUPS

	Groups Teachers Were Most Like						
H Groups	1	2	3	4	5	6	7
1	6	1			1		
2		15					
3			6				
4				17			
5					24	1	
6					1	11	
7		3				1	6

In Table 3, the initial classification of the 93 teachers is substantially confirmed with only eight misclassifications in groups 1, 5, 6, and 7. No further data were collected from these eight teachers. Because three of the teachers assigned to group 7 more properly belonged to group 2 (and one to group 6), when the F-matrix (Table 4) is examined, groups 2 and 7 cannot be differentiated. Since the critical F-value at the .05 significance level is 2.22 and since all values except those for groups 2 and 7 exceed this critical value, all other groups can be discriminated from one another. There are certainly six, and probably seven, distinctive ways in which subgroups residing in the total sample of 93 teachers construe the teaching of writing.

TABLE 4

INTRA-GROUP F-VALUES

Group	1	2	3	4	5	6
2	3.80					
3	14.74	21.57				
4	14.86	5.98	38.51			
5	2.56	12.78	16.27	40.61		
6	2.68	6.14	18.15	18.69	4.58	
7	2.99	.62	16.18	7.42	6.81	3.80

While the Hierarchical Grouping clustered the teachers so as to maximize their group differences, the stepwise discriminant analysis determined the extent and manner in which these defined groups of subjects could be differentiated. When centroids, or points representing the groups, were located in the discriminant space, they were separated from each other to a maximum degree. The centroid teachers in each group were defined as those with a probability of approximately 1.00 of being located in that group and in no other. Points representing all the other teachers in the sample were also located within the space. Each cluster of teachers thus contained individuals whose sorting behaviours or occupational perspectives on the teaching of writing were similar. The seven resultant groups can be denoted as teacher types. Aitkin et al. (1981) emphasized that clustering methods must be based on the probabilistic nature of cluster membership if they are to have any validity.

Thirty centroid teachers from 18 different high schools were identified. They were invited to have their pupils' progress in writing charted during the next academic year; however, it was possible to proceed with a rational sample of only 15 centroid teachers from nine schools, with all seven groups of constructions still being represented. These teachers, together with the number of categories that they formed, are indicated below in Table 5. These categories are regarded as their personal constructions of the teaching of writing.

TABLE 5

FIFTEEN CENTROID TEACHERS
AND NUMBER OF CONSTRUCTS FORMED

Group	Teacher Code Number	Number of Constructs
1	1004	11
	1901	12
2	0403	13
	2003	13
3	1908	9
	1103	10
4	2201	8
	0705	4
5	1702	10
	2001	13
6	0701	16
	1905	20
	1906	17
7	1301	5
	0405	7

Clinical Analysis and Results

If the more common types of thinking about teaching are to be discussed, statistical investigation of some kind is inescapable; however, clinical methodologies are also needed in order to move even more closely to the dynamic reality of teachers' cognitions. Though the task of abstracting teachers' perspectival styles is not to be underestimated, the 20 nuclear categories or constructs shared to a greater or lesser extent by all of the teachers made it possible to study the similarities and the dissimilarities between the seven kinds of ideational complexes.

The groups were compared by inspecting to see which of the 20 categories they perceived and which they ignored. The items in each category were first examined, however, for the conditional probabilities, as indicated in Table 6, that reveal the nuclear membership. Only constructs XI and XIV did not contain two items with probabilities of at least .85.

For each of the seven groups, when both teachers made these nuclear groupings of items, a tally was kept. The third teacher's sort in group 6 was not used so that the results could be more easily compared; they are presented in Table 7.

All of the groups perceive the two categories relating to the mechanical skills and to warm teacher-student relationships (except group 2 for this latter

construct). These two ideas suggest the traditional and the progressive pedagogies of writing, respectively. From Table 7 it is expected that groups 2 and 4 are to prove less prominent, while groups 5, 6, and 7 are likely to emerge as more so.

TABLE 6

ITEM MEMBERSHIP AND LEVELS OF PROBABILITY

Nuclear Category	Probabilities			
	1.00	.99-.95	.94-.90	.89-.85
	Items	Items	Items	Items
I	17,23,50	45,49		12
II	8,26,58,69		73	
III		44	25,74	
IV	34	28,52		21,66
V		51	54	
VI		2	9,27	
VII	77,80			
VIII	47,53			42
IX		56,60	78	
X		37	38	
XI		5		(6)
XII	3	7	4	
XIII		48,70		
XIV	1			(55)
XV	16,18,19			13
XVI			46	61
XVII	35,36			
XVIII		24	63	
XIX			43	31
XX			22,40	

TABLE 7

NUCLEAR CATEGORIES RECOGNIZED OR NOT BY EACH GROUP

Group	Number of Categories Perceived	Categories Uniquely Perceived	Categories Perceived by 2 Groups	Categories Perceived by 3 Groups	Categories Not Perceived	Construct System
1	8		Difficulties in Writing; The Best Writing	Deductive Model; Correctness Vs Appropriateness	Motivation	Traditional
2	7			Deductive Model	Motivation; Pupil Talk; Pupils Positive	Traditional
3	9		Motivation	Sense of Audience; Correctness Vs Appropriateness	Pupil Talk	Mixed
4	8			Sense of Audience; Correctness Vs Appropriateness	Motivation; Pupils Positive	Traditional
5	12	Teacher Domination; Current Criticisms	Ideal Teacher of Writing; The Best Writing	Sense of Audience	Motivation; Pupil Talk	Mixed
6	5	Natural Development	Difficulties in Writing	Correctness Vs Appropriateness	Motivation; Pupil Talk; Pupils Positive	Mixed
7	13	Futility of Abstractions	Motivation; Ideal Teacher of Writing	Deductive Model; Sense of Audience		Progressive

Discussion

For teachers of year ten English, the low similarity indices clearly show divisions or segmentation at the level of ideas or constructs. Based on the more distinctive categories formed by the seven groups (see Table 7), a series of vignettes is offered of their ethnoparadigms (Imershein, 1977).

Both teachers in group 1 project a somewhat traditional point of view, dwelling on the best writing and the difficulties posed by writing. Also in a formal transmission mode, the teachers in group 2 are concerned with deductive teaching and matters of correctness. Both teachers in group 3 somewhat ambivalently set motivation and inductive teaching against the deductive model, while those in group 4 appear undecided, teaming a sense of audience with a concern for correctness. These four teachers have either a traditional or perhaps a mixed view of teaching writing. The teachers in group 5, however, are able simultaneously to sustain awareness of four constructs; that is, the current state of the teaching of writing, questions of teacher domination, notions of the ideal teacher of writing, and the intended audience. In contrast, the teachers in group 6 appear to be younger and almost in a state of ideational flux or paradigmatic shift. They combine a progressive appreciation of the natural development of writing with some preoccupation with the difficulties involved in writing, particularly those relating to correctness. Finally, both teachers in group 7 are not only uniquely concerned with the futility of teaching writing by abstract precept, but they are also attuned to concepts of motivation and the ideal teacher. Unlike group 2, this last pair may well have a progressive view of teaching writing. This difference seems pedagogically rather than statistically significant.

Turning to those categories that are ignored, it is seen that only the teachers in group 7 conceive of writing both for pleasure and as a result of motivation. The teachers in groups 2, 3, 5 and 6 fail to attend also to the importance of talk, while those in groups 2, 4 and 6 do not recognize pupils as essentially positive and creative. The teachers of English have been shown to be sensitive to certain aspects of the reality of teaching writing but not to others. William James (1890) aptly depicted the mind as a theatre of simultaneous possibilities with consciousness consisting in the comparison of these with each other, the selection of some, and the suppression of others. The world that teachers feel and work in is that which their teachers and they themselves, by slowly cumulative strokes of choice, have extricated out of this, like sculptors, by simply rejecting certain portions of the stuff of pedagogy. Six of the teacher groups seem to have suppressed the progressive possibilities in teaching writing.

Although group differences exist empirically among English teachers' constructions of teaching writing and sense can be made of the branching within this cognitive community, under an interpretive analysis most of the teacher types seemed somewhat skills-based or traditional in their ideas about the teaching of writing. Such a convergence of interpretational schemes, despite initial expressions of pluralism, requires that some implications be drawn.

Hammersley (1977, p. 112) states that there is a tendency in the classroom for progressive practices to deviate towards more discipline-based teaching as the teacher finds it necessary to demonstrate efficiency and control. The present study has shown a convergence even at the level of paradigm. Berlak and Berlak (1975, pp. 14-15) agree that paradigmatic dilemmas or inconsistencies are normal for teachers since in the course of living they come to accept some contradictory

ideas about the proper relationship between authority and child and about how much discomfort is required for true learning. These basic beliefs are intermixed with other ideas that arise from their experiences of teacher education. To these ideas are added those that derive from the individual teacher's daily experiences with children in school and from the particular constraints of the given school.

Teaching may be like diving with some routines being much more difficult and likely to end in failure. Kremer (1978, p. 993) writes that, while a traditional viewpoint of teaching has well-defined goals that are relatively easy to assess and allow for uniform ways of teaching, progressive goals are heuristic in nature and do not imply specific and clear cut ways of teaching. For example, merely encouraging intending teachers to treat children as resources "is like telling people to be good: it strikes a responsive chord but the sound does not last very long" (Sarason, 1971, p. 195). It does not help merely to tell teachers to accept and respect children and to build on what they are if the teachers do not know how to work with their own classes on a daily basis. No matter how idealistic teachers may be in the beginning, their hopes are soon crushed if they are unable to reflect upon and translate their constructs into practice. They cannot just "stretch out with their feelings."

Without clear guidelines, teachers may well develop a sense of helplessness, a "They Won't Let Me!" mentality, behind which they can shelter in order to justify traditional teaching behaviours (Diamond, 1982). There is a strong possibility that teacher education does not equip intending teachers with the necessary self-direction, understanding, and conceptual tools. Lectures about child-centredness, creativity, and tolerance may need to be supported by training which works through and models these processes. As one of the representative teachers explained,

> Most of my ideas started at college but I just didn't understand them then. Trainee teachers often don't understand their college "gear." Especially in your first years you reproduce the teaching you experienced. You try to emulate your teachers and what works.

Conclusion

One difficulty with the present study is that using groups of teachers rather than individuals as the unit of analysis tends to mask relationships and to yield a smaller volume of important information (Good, Biddle & Brophy, 1975, p. 44). In order to retain the richness of teacher perceptions, the free-sort of each centroid teacher needs to be inspected. However, it is difficult to analyse such involved data in a replicable way. Individual multidimensional scaling may be particularly suited to such a situation.

While the present study has been concerned with the differentiation of English teachers' thinking about the teaching of writing, the integration and articulation of such structures also need to be explored. It may be that a teacher's professional socialization and development may be interpreted not as the mere accretion of more and more pieces of information but as the growth of an increasingly complex structure for clearly organizing and interpenetrating ideas with unifying insight.

Since fewer pedagogically than statistically significant differences were found in teachers' perspectives, teacher education courses may need to follow the

strategies they advocate and to make their theory become their practice; that is, if teachers are to differ at all in their constructions of teaching. Unless personalised and child centred teaching can be seen to be implemented, it may remain at the level of rhetoric. As another teacher explained,

> It's very frustrating not being able to put your ideas into practice. It makes you go back to safer ideas. You pull back. If you're not sure of your ground, I guess you just go back. Ideas are so amorphous.

References

Aitkin, M., Bennett, S. N., & Hesketh, J. Teaching styles and pupil progress: A re-analysis. *British Journal of Educational Psychology*, 1981, *51*, 170-185.

Ashton, P., Kneen, P., Davies, F., & Holley, B. J. *The aims of primary education.* London: Macmillan, 1975.

Barker-Lunn, J. *Streaming in the primary school.* Slough: National Foundation for Educational Research, 1970.

Barnes, D., & Shemilt, D. Transmission and interpretation. *Educational Review*, 1974, *26*(3), 213-228.

Bennett, N., Jordan, J., Long, G., & Wade, B. *Teaching styles and pupil progress.* London: Open Books, 1976.

Berlak, H., & Berlak, A. Toward a political and social-psychological theory of schooling. *Interchange*, 1975, *6*(3), 11-21.

Brophy, J. E., & Evertson, C. M. *Process-product correlations in the Texas Teacher Effectiveness Study: Final report.* Austin: University of Texas, 1974.

Combs, A. W., & Soper, D. W. The perceptual organization of effective counselors. *Journal of Counselling Psychology*, 1963, *10*(3) 222-226.

Cyphert, F. R. An analysis of research in teacher education. *Journal of Teacher Education*, 1972, *23*(2), 145-151.

Diamond, C. T. P. The skills or growth: English teachers' thinking about the teaching of writing. *English in Australia*, 1979, *48*, 57-66.

Diamond, C. T. P. A note on measuring teachers' constructs. *Research in the Teaching of English*, 1980, *14*(2), 161-164.

Diamond, C. T. P. "You always end up with conflict": An account of constraints in teaching written composition. In R. D. Eagleson (Ed.), *English in the eighties: Conference papers.* Sydney: Australian Association for the Teaching of English, 1982.

Evans, G. T. The analysis of categorizing behaviour. *Psychometrika*, 1970, *35*(3), 367-392.

Good, T. L., Biddle, B. J., & Brophy, J. E. *Teachers make a difference.* New York: Holt, 1975.

Gray, J., & Satterly, D. Formal or informal? A re-assessment of the British evidence. *British Journal of Educational Psychology*, 1981, *51*, 187-196.

Hammersley, M. *Teacher perspectives.* London: Open University Press, 1977.

Imershein, A. W. The epistemological bases of social order: Toward ethnoparadigm analysis. In D. R. Heise (Ed.), *Sociological Methodology.* San Francisco: Jossey-Boss, 1977.

James, W. *The principles of psychology.* New York: Dover, 1950 (original, 1890).

Kelly, G. A. *The psychology of personal constructs.* New York: Norton, 1955.

Kerlinger, F. N. Progressivism and traditionalism. *Journal of Social Psychology*, 1958, *48*, 111-135.

Kerlinger, F. N. The first and second-order factor structures of attitudes toward education. *American Educational Research Journal*, 1967, *4*(3), 191-205.

Kremer, L. Teachers' attitudes toward educational goals. *Journal of Educational Psychology, 1978, 70*(6), 993-997.

Miller, P. J. Teachers' opinions and the ideational basis of education. *Alberta Journal of Educational Research, 1981, 27*(2), 182-191.

Miller, D. M., et al. *Elementary school teachers' viewpoints of classroom teaching and learning.* Report, United States Office of Education, University of Wisconsin, 1967.

Rosenshine, B. Classroom instruction. In N. L. Gage (Ed.), *The psychology of teaching methods.* Chicago: National Society for the Study of Education, 1976.

Runkel, P. J. Cognition similarity in facilitating communication. *Sociometry*, 1956, *19*, 178-191.

Runkel, P. J., & Damrin, D. E. Effects of training and anxiety upon teachers' preferences for information about students. *Journal of Educational Psychology*, 1961, *52*(5), 254-261.

Sarason, S. B. *The culture of the school and the problem of change.* Boston: Allyn and Bacon, 1971.

Smith, L. M., & Geoffrey, W. *The complexities of the urban classroom.* New York: Holt, 1968.

Soar, R. S. *Follow through classroom process measurement and pupil growth — 1970-1971: Final report.* Gainesville: University of Florida, 1973.

Sontag, M. Attitudes toward education and perception of teacher behaviours. *American Educational Research Journal*, 1968, *5*(3), 385-401.

Stallings, J. A., & Kaskowitz, D. H. *Follow through classroom observation evaluation — 1972-1973.* Menlo Park: Stanford Research Institute, 1974.

Triandis, H. C. Cognitive similarity and interpersonal communication in industry. *Journal of Applied Psychology*, 1959, *43*, 321-326.

Wiley, D. E. Latent partition analysis. *Psychometrika*, 1967, *32*(2), 183-194.

The Alberta Journal of Educational Research *Vol. XXIX, No. 1, March, 1983, 31-45*

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The Effect of School Management Patterns on Organizational Effectiveness

This study contains a description and discussion of an investigation of the relationship between principal-teacher-student interaction and school effectiveness. The theoretical model developed by Rensis Likert was utilized to study school interaction. The interaction-influence theory postulated by Likert predicts different relationships among management patterns, group performance and organizational effectiveness. The need-press theory of George Stern was utilized as the criterion of effectiveness. From results of the study, it is suggested that leadership in the school has an effect on organizational effectiveness and that implementation of a system four management pattern could lead to an improved environment for students.

The organization and administration of schools is a perpetual concern to decision makers in education. Insights into the nature of effective management are of paramount importance to leadership theorists. Indicators of organizational effectiveness could provide direct benefit to educators as well as to students. The study (Donnelly, 1980) reported in this paper was designed to test and evaluate one theory of leadership effectiveness.

The Management Pattern Model

Rensis Likert and his colleagues at the University of Michigan's Institute for Social Research have spent more than three decades studying issues surrounding effectiveness and adaptability in different types of organizations. More recently, management systems of educational organizations have been investigated at this institution. The management systems theory states that the management pattern of an organization can be placed on a continuum somewhere between a most

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primitive style and a most socially evolved pattern. The theory predicts different relationships among management patterns, group performance and organizational effectiveness.

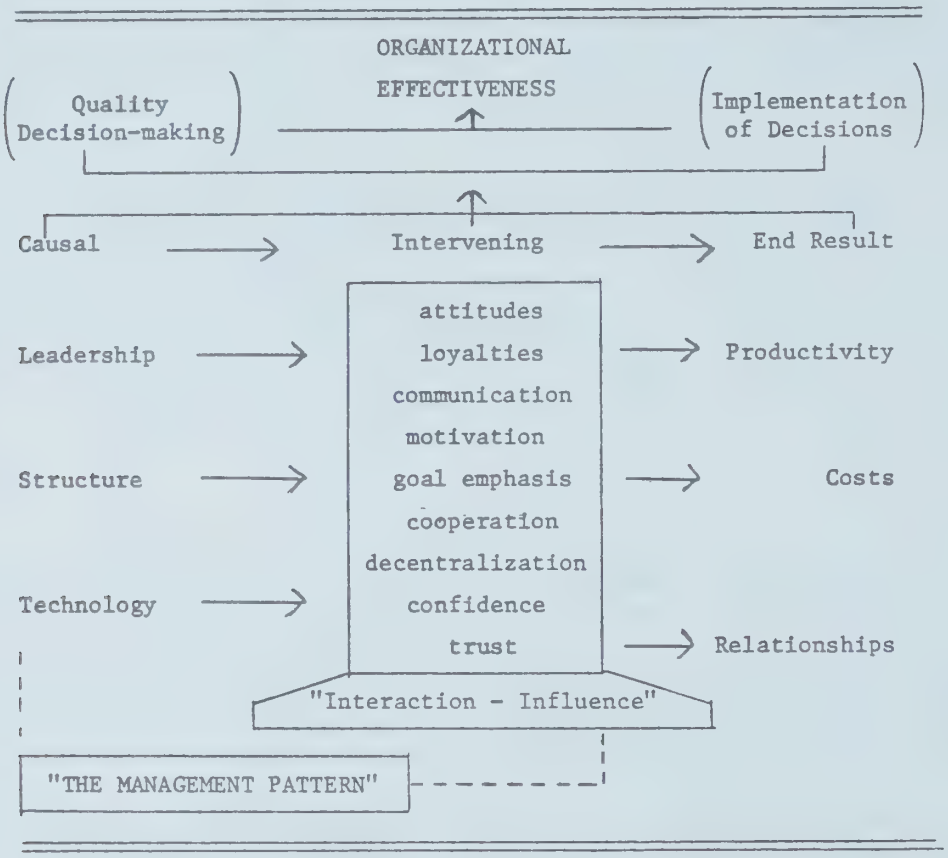

Figure 1. Likert's Interaction-Influence Theory.

Figure 1 illustrates the main concepts of Likert's interaction influence theory. It suggests that the effectiveness of any working group is proportional to the combined ability of its members to make and implement quality decisions. Likert has identified causal, intervening and end-result variables as the three main categories of elements acting upon this two-fold decision process.

The causal variables are those over which the management has at least partial control. They include leadership, structure (ways in which organizational components are organized to communicate with each other), and technology. The intervening variables refer to the conditions that exist among the members of the work group. In the case of schools, this set of variables describes the social relationships among teachers as well as the disposition of the teacher toward the overall work situation. A well developed social system would be characterized by highly positive ratings on the intervening variables of attitudes through trust. Likert has also demonstrated that the social system, and hence the intervening variables, improves in direct proportion to the amount of interaction and the degree of influence perceived by subordinates. The end result variables are the output measures or the effectiveness measures of the organization. The arrows of the figure illustrate the sequential relationships among the three sets of variables. Causal inputs are mediated through the intervening system to produce end results that can be categorized as relating to productivity costs or relationships. If the

leadership is strong, the structure appropriate, and the technology available, the resultant intervening social system will not only be capable of producing highly desirable end results, but also will be able, as Likert has shown, to make adaptations that are necessary to maintain a high level of effectiveness.

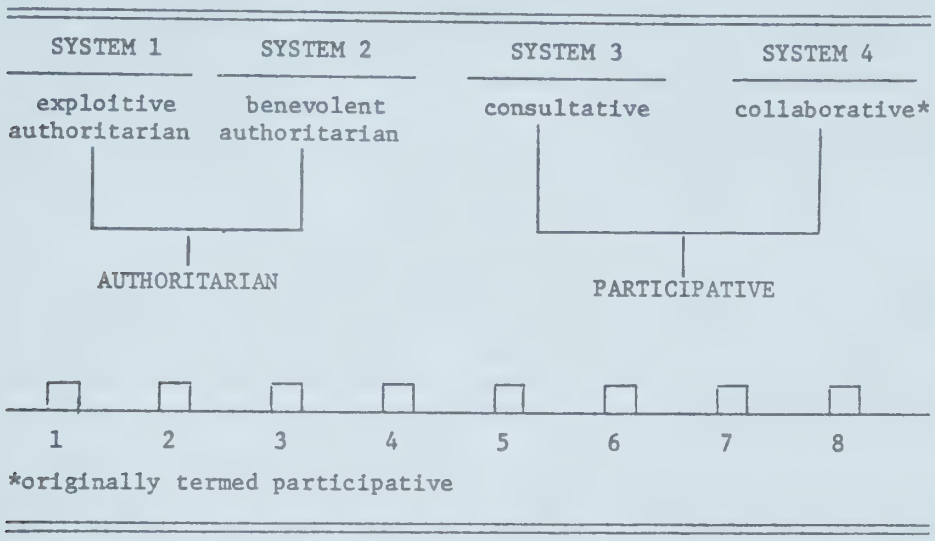

Figure 2. The Likert system's model.

Figure 2 illustrates the relative terminology used to describe the four systems of Likert's management theory. The most primitive style of management is characterized as authoritarian while the most socially evolved is described as participatory.

The exploitive-authoritarian approach to management concentrates on practices that place decision, direction, and surveillance in the hands of management. Employees are considered to be a market commodity and their time and labour is thought to be purchased solely for the benefit of the organization. Decision-making is a prerogative of the senior management personnel who use downward communication to direct the activities of subordinates. Motivation is based on the external use of fear and punishment. Performance tends to be mediocre.

The benevolent-authoritarian approach to management is much like the exploitive system in that its major assumptions still place most of the authority in the hands of the superiors. Its means of motivation, however, are less coercive than the former because it rewards people with a system of incentives based on individual competition and isolation. Supervision is still done on an individual basis but some upward communication and consultation are accepted. While this method still expects employee subservience, attempts are made to remove some of the aspects of the coercive system that subordinates find annoying.

Management in a system three organization still reserves the right to decision-making and directing of the organization but it differs in a number of ways from the previous systems. Employees are no longer looked upon as market commodities; much of the surveillance is removed, little coercion exists and valid two-way communication is maintained by a person-to-person consultative relationship between subordinates and their immediate superiors. Motivation emphasizes positive approaches, more responsibility is delegated to lower level managers, and all individuals within the organization are encouraged to become

accomplished specialists. This atmosphere encourages managers and their subordinates to be reasonably committed to the organizational purposes. Cost factors, performance levels, and employee satisfaction tend to be good.

In the collaborative system, employees and managers both exert control over the work situation. Based on an interaction influence model, management views employees to be an important element in the decision-making process. The manager's function becomes one that facilitates the process more than one of actual decision-making. Overlapping organizational structures, multiple group memberships, team approaches to problem-solving, open communication, easy access to information, mutual trust and cooperation provide a climate of willing participation that capitalizes on the expertise of all concerned. This system is characterized by good labour relations and high performance outputs.

The management pattern of an organization can be operationally defined as the score obtained on the "Profile of Organizational Characteristics" (Likert Associates, 1972). This instrument was developed by Likert to measure organizational concepts that had been theoretically derived from research in business organizations. In 1968 Likert developed an instrument to measure the management pattern of educational organizations. The instrument has gone through several revisions and has resulted in the Profile of a School Questionnaire.

The Application of the Model to School Effectiveness

Likert suggests that causal variables are mediated through the intervening variables to produce end results. The end result variables are the determining factors of effectiveness. MacKillican (1975) made this concept operational by outlining the relationship between two levels within a school.

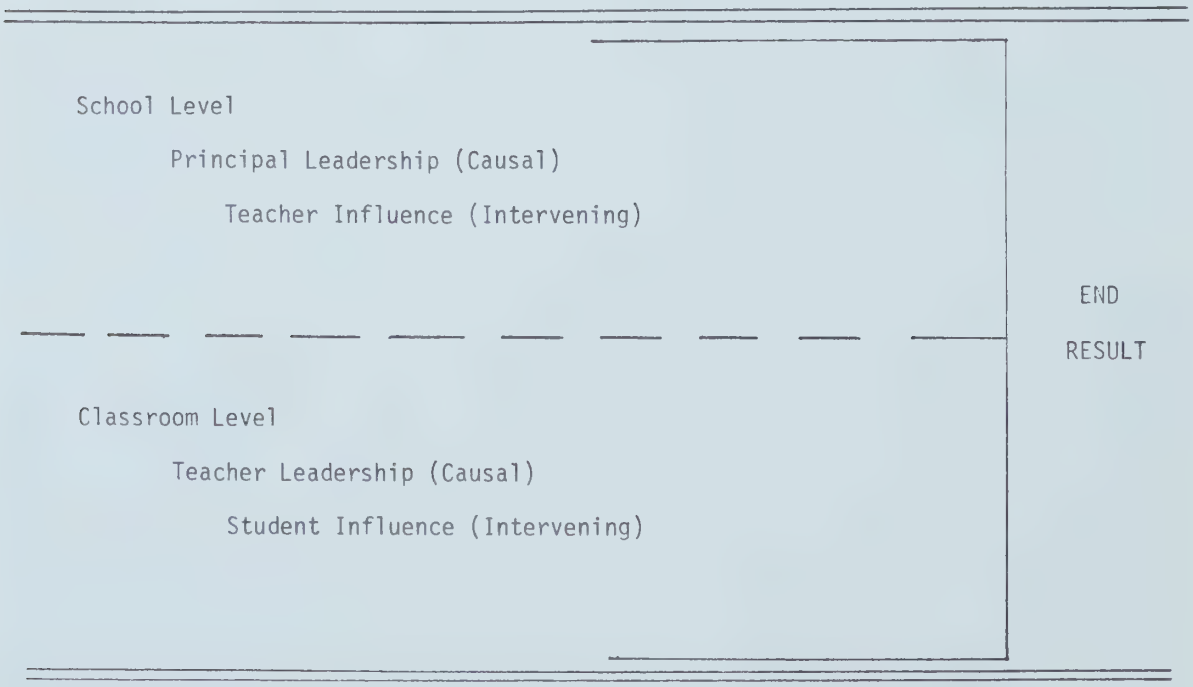

Figure 3. Theoretical relationship between the two levels of leadership and influence.

As indicated in Figure 3, leaders within a school (principals) create a management pattern that permits reciprocal influence by teachers. This in turn generates teacher leadership that creates a management pattern at the classroom level which engenders student influence. These patterns, at the school level and the classroom level, collectively affect end results. The end result becomes a measure of organizational effectiveness. In an investigation of the contingency model of leadership, Garland and O'Reilly (1976) advocate the use of Likert's model to study organizational effectiveness. Researchers at that time suggested that Likert represented a dominant tradition in the field of leadership theory and organizational analysis.

A Measure of Organizational Effectiveness

The researchers wished to select a technique which captured a variety of output variables in different schools. In addition it was essential that the theoretical system for the measure be compatible with Likert's theory. The index of organizational effectiveness had to be defensible in view of Likert's concept of causal, intervening, and end result variables.

A primary function of a school staff is to create a school environment which will foster self-actualization in students (Stern, 1971). This position departs from the traditional view of school effectiveness centering upon academic achievement usually demonstrated by high scores on standardized tests. These test results are related to the presumed central purpose of the school which is to develop the rational power of students. It is suggested that this central purpose is subordinated to major values of individual dignity and human progress (Weinstein & Fantini, 1970). A learning environment which fosters self-actualization of students is a reliable measure of success in an educational organization (Combs, 1970). This view was supported by Bloom (1972) in an article where he argues that we can best serve education and society by providing an environment which takes care of the educational needs of students. Bishop (1972) also supports the view that the staff of a school must accept major responsibility for the sociopsychological climate for learning which pupils perceive in a school.

To conceptualize the idea of school environments it was necessary to locate a theory which deals with a multitude of variables including both latent and manifest functions of staff effort. Stern's extension of Murray's (1938) need-press theory provides a comprehensive model for studying environments in relation to psychogenic needs. Stern (1970) based his theory on the perception of press. He suggests that personality needs are transposed to environmental counterparts or press. Behaviour and personality development occur when environmental variables act as stimuli through the medium of perception. Press varies from hindering the development of a need to facilitating the need. Therefore, an effective environment would facilitate the development of needs which are characteristic of a self-actualizing person.

There is compatability between the theory of Likert and the theory of Stern. The relationships are found in the similarity of constructs and in the conceptualization of the process of activity in terms of causal, intervening, and end-result variables. Both theories utilize as a common base the construct of need. Likert (1976) notes the tendency of human energy to be allocated to the satisfaction of prepotent needs and, in particular, self-actualization needs when lower order needs have been met. Likert suggests that the inherent desire to

achieve and maintain a sense of personal worth and importance is the motive source for a variety of needs. Stern (1970) defined need as "organizational tendencies which appear to give unity and direction to a person's behavior" (p. 6). Thus, in both theories, needs motivate behavior and are inferred from activity. The leadership of the principal creates a group atmosphere at the staff level. Each teacher creates a classroom environment which creates press for students. The school is effective to the extent that these press characteristics represent a self-actualizing environment.

Stern (1970) developed the High School Characteristics Index (HSCI) on the basis of the need-press model. The HSCI is designed to measure the degree to which schools provide a self-actualizing experience for adolescent students. More recently Stern and Walker (1973) developed the Classroom Environment Index (CEI) to measure the effectiveness of the elementary school environment as perceived by students. The CEI consists of thirty scales which represent external environmental counterparts of the thirty personality needs used by Stern in developing his previous instruments. In validation studies Stern and Walker (1973) derived six first-order factors. They indicate that factors one to four represent developmental press which describes conditions that facilitate growth and development. Factors five and six deal with control press which refers to organizational control and maintenance. The developmental factors arranged in relation to the control factors are as follows.

Developmental Press

1. *Humanistic Intellectual Climate.* This factor reflects the qualities of a staff and plant specifically devoted to scholarly activities in the humanities, arts and social sciences. It includes aspects of achievement together with elements of contemplation and social concern.

2. *Group Intellectual Life.* Classrooms high on this factor are characterized by fun-loving, friendly, actively outgoing environments which provide for mutually supportive group activities. It includes aspects of intellectuality, reflectiveness, objective thinking, and practicality.

3. *Achievement Standards.* This factor is characterized by high standards of achievement, an emphasis on striving for success through personal effort and on planned, purposeful and organized activities. A degree of intense emotional expression is in evidence.

4. *Personal Dignity.* Classrooms scoring high on this factor are characterized by a stress on individual responsibility and personal autonomy. Tolerance, self-confidence and friendliness are also evident.

Control Press

5. *Orderliness.* This factor reflects an emphasis on organization and structure within the academic environment along with administrative concern for the physical well being of students. Caution and seriousness are evident.

6. *Non-science.* This factor reflects environments with an absence of an interest in the natural sciences together with a lack of aspects associated with sexuality and egotism (Stern & Walker, 1973).

The theoretically effective environment is characterized by high scores on the Developmental Press factors and low scores on the Control Press factors. According to Stern and Walker, this pattern represents a self-actualizing environment. Using the CEI, researchers are able to ascertain if a classroom environment is present which facilitates optimum development of human capacities.

Throughout the work by Stern and then by Stern and Walker, the need-press model proposed by Murray was utilized. Their work has culminated in several instruments, namely the Activity Index, College Characteristics Index (CCI), and the Organizational Climate Index (OCI). The CEI appeared to be an appropriate index of classroom effectiveness to be used within the context of Likert's theory.

The Research Problem, Design and Hypotheses.

The theoretical rationale for the study was based on Likert's theory of management patterns and the Stern need-press model. As indicated earlier there is a fundamental relationship between the two theories and both are compatible with a number of administrative theories. Schools differ in terms of the type of management pattern prevalent in the organization. These patterns have been arrayed on a continuum from Exploitive Authoritarian to Participatory. The theoretical relationships that exist among causal, intervening and end-result variables enable one to predict a positive relationship between the management pattern system score and the developmental press score. An examination of data available from previous research indicates that there would be a need to test the relationship between management system and press. It was predicted that there would be a difference in effectiveness between elementary schools with high management pattern scores and schools with low school management scores.

The variables of the study were school management patterns and classroom effectiveness.

Procedure

The data collection involved two phases. In stage one, the Likert and Likert Profile of a School instrument was distributed to 288 teachers randomly selected in 24 schools. Likert has indicated that a sample of eight to ten teachers within a school would represent an adequate measure of School management practices. Each school was required to have a minimum of 14 teachers and to offer a program to grade seven and eight students. In addition each principal was to have been in the school for a period of at least two years. Likert (1972) suggests that principals should be in a school for at least two years before an organizational climate inventory is completed.

Schools which produced high or low scores on the Profile of a School Questionnaire were used to indicate the polar extremities of the continuum represented in Likert's theory. The low SMP (School Management Pattern) schools were defined as those schools in the initial sample with the lower quartile score. The SMP scores for these institutions ranged from 4.93 to 5.35. Since Likert (1972) provided a mean score of 5.36, all of these schools registered below

the comparable mean. The high SMP schools were those above the upper quartile score. These schools had SMP scores ranging from 5.91 to 6.42.

The second phase of the study involved the collection of criterion data on school effectiveness. Data were obtained from students in classrooms of the schools that scored high or low on the Profile of the School Questionnaire. A total of 561 student responses were utilized in the second stage of the study. The students were administered the Classroom Environment Index developed by Stern and Walker. There were six schools classified as high SMP schools and five classified as low SMP schools. Classrooms were randomly selected within each school, one grade seven class and one grade eight class.

Scales

The Profile of a School instrument was used to measure School Management Patterns (SMP). The score obtained is a measure of teacher perception of the way in which a school is managed. Likert adapted the Profile of a School Questionnaire from a similar instrument used by business organizations to compare certain variables with organizational effectiveness. The original Profile of Organizational Characteristics was empirically tested against such organizational variables as productivity, employee turnover, cost factors, employee motivation, labour relations, and profit margins. The validity of the profile was concluded from its accurate ability to predict organizational outcomes or end-results from a measure of internal conditions. Reliability scores from these studies ranged from .7 to .9. The Profile of a School indicated split-half reliabilities .90 to .95 (Likert, 1972).

Although the quantity of studies in school settings has lagged behind those in business, several have confirmed this instrument's validity as an accurate predictor of such desirable school outcomes as high school achievement, teacher satisfaction, decreased teacher strikes, high student satisfaction, and less school vandalism.

The Classroom Environment Index was used to measure the effectiveness of the elementary school environment as perceived by students. The CEI consists of 30 scales which represent environmental counterparts of the 30 personality needs used by Stern in the development of the index. Each of the 30 scales of the CEI consists of 10 items making a sum of 300. Stern (1973) has reported reliability coefficients for the six first-order factors ranging from .56 to .85.

Hypotheses

The hypotheses were derived from the theory presented in the first part of this paper. The major hypothesis provided a direct test of Likert's theory and Stern's model of effectiveness.

1. High School Management Pattern elementary schools will score significantly higher than Low School Management Pattern elementary schools in the Developmental Press scores, Humanistic Intellectual Climate, Group Intellectual Life, Achievement Standard, and Personal Dignity, and lower on the Control Press Orderliness and Non-science.

A review of the literature suggested that the following hypotheses should be supported.

2. There is no difference between grade levels and student perception of environmental press.

3. There is no difference between sex classification and student perception of environmental press.

4. There is no difference in environmental press between schools within High School Management Pattern Schools.

5. There is no difference in environmental press between schools within Low School Management Pattern Schools.

Analyses

The statistical treatment for the analyses was multivariate analysis of variance with sex and grade level as blocking variables and the sex CEI factor mean scores as the variates. These mean scores were generated from the 30 scale scores of the CEI and scored at the University of Syracuse. The analysis was done within the full rank linear model approach (Carlson & Tim, 1974) using the generalized variance ratio statistic.

TABLE 1

CLASSROOM ENVIRONMENT INDEX SCORES

Factor (Press)	High SMP Schools	Low SMP Schools
Humanistic Intellectual Climate	29.665	28.917
Group Intellectual Life	29.574	28.336
Achievement Standards	26.442	25.292
Personal Dignity	29.110	29.097
Orderliness	22.513	22.896
Non-Science	14.773	14.913

The test of the first hypothesis indicated that the differences in perception of press between high and low SMP schools is significant at the .0001 level. The mean scores for the first four factors which Stern called Developmental Press are 114.694 in high SMP schools and 111.642 in low SMP schools. The mean scores

for factors five and six which Stern called Control Press were 37.80 in high SMP schools and 38.03 in low SMP schools. Therefore students in high SMP schools perceive the environment to be higher in developmental press and lower in control press than students in low SMP schools. The mean difference between high and low SMP schools differed significantly for all six factors, as shown in Table 3.

TABLE 2

F RATIOS FOR CLASSROOM ENVIRONMENT INDEX

Hypotheses	df 1	df 2	*F*	*p*
H1 (SMP)	6	514	194.587	.0001
H2 (Grade)	6	514	2.881	.0090
H3 (Sex)	6	514	.594	.7355
H4 (School High SMP)	30	2058	3.141	.0001
H5 (School Low SMP)	24	1799	4.873	.0001

TABLE 3

F RATIOS FOR INTERNAL FACTORS

CEI Factor	df 1	df 2	*F*	*p*
1. Humanistic Intellectual Climate	1	519	344.696	.0001
2. Group Intellectual Life	1	519	281.345	.0001
3. Achievement Standards	1	519	390.337	.0001
4. Personal Dignity	1	519	298.216	.0001
5. Orderliness	1	519	170.208	.0001
6. Non-Science	1	519	108.537	.0001

The multivariate *F* ratio for the second hypothesis was significant at the .0090 level. Mean scores suggest that grade seven students tended to see a more positive environmental press than did grade eight students. The mean developmental press score for grade seven students was 115.11 and for grade eight students 113.23. Interestingly, the control mean press score for grade seven was 37.60 and for grade eight, 37.46.

The multivariate *F* ratio for the third hypothesis was not significant. Schools with high SMP and schools with low SMP did not differ in effectiveness as far as the sex of the student is concerned. There was not a marked difference between the environmental press as perceived by boys or by girls.

The fourth hypothesis indicated a significant difference of $p=.0001$ between the six schools nested within high SMP. The univariate F Ratios indicated that the significant differences were accounted for by Group Intellectual Climate, Achievement Standards, and the Control Press factors Orderliness and Non-Science. The results are shown in Table 4.

TABLE 4

F RATIOS FOR NESTED FACTORS—HIGH SMP

CEI Factor	df 1	df 2	F	p
1. Human Intellectual Climate	5	519	1.429	.2120
2. Group Intellectual Life	5	519	5.758	.0001
3. Achievement Standards	5	519	3.164	.0080
4. Personal Dignity	5	519	1.352	.2409
5. Orderliness	5	519	3.608	.0032
6. Non-Science	5	519	3.973	.0015

The test of the fifth hypothesis indicated that the differences between schools nested within low SMP schools was also significant. As in high SMP schools, most of the differences were found in Group Intellectual Life, Achievement Standards, Personal Dignity, Orderliness, and Non-Science. Results are shown in Table 5.

TABLE 5

F RATIOS FOR NESTED FACTORS—LOW SMP

CEI Factor	df 1	df 2	F	p
1. Human Intellectual Life	4	519	2.586	.0362
2. Group Intellectual Life	4	519	11.620	.0001
3. Achievement Standards	4	519	4.756	.0009
4. Personal Dignity	4	519	4.634	.0011
5. Orderliness	4	519	4.211	.0023
6. Non-Science	4	519	4.838	.0008

Discussion

The study was undertaken to investigate the relationship between teacher and student perceptions of school environments. The study provided a test of Likert's School Management Patterns theory and Stern's need-press model. Likert has suggested that the process of activity in an organization takes place in terms of causal, intervening, and end-result variables. Utilizing this framework, leadership was conceptualized as a causal variable, school management pattern as an

intervening variable, and student perception of the school environment as an end-result variable. Evidence was presented indicating that the relationship between causal and end-result variables is mediated by intervening variables. This study supports that contention. Using the concept of press it was shown that high SMP schools were perceived to be more effective than low SMP schools. High SMP schools were indicative of high developmental press. Schools perceived to be effectively led in terms of the Likert model were perceived to have an environment fostering high developmental press.

Similarly, schools reflecting high SMP scores were hypothesized to have a lower control press climate than schools with low SMP scores. The hypothesis was substantiated. Schools with leaders that fostered management patterns in system three or four in the Likert model created an environment which students perceived to be low in control press. Earlier studies (Appleberry & Hoy, 1969) using the Pupil Control Ideology model support the findings of this study. More autocratic management patterns with a low degree of interaction influence were related to higher normative control in terms of students.

An earlier study by Garland (1973) which utilized the Fiedler contingency model did not substantiate the predicted relationships between LPC scores and effectiveness scores. The authors at that time suggested that the Likert model might be more appropriate for testing such a relationship. It appears that the conceptual framework involving the intricate relationships among causal, intervening, and end-result variables enables the researcher to predict possible outcomes. Schools which are attempting to facilitate student development by creating an environment conducive to student growth should look carefully at the interaction influence model proposed by Likert and investigated in this study.

Although the data in this study did support the theory in the predicted direction, the differences were not as pronounced as one would suspect. This is probably due to the type of schools investigated in the study. The data were collected in the month of June, therefore many of the students had only been in the school for one year. It is possible that it takes at least one academic year for students to accurately describe the learning environment. This factor does not explain the lower score for grade eight pupils on developmental press. Part of the answer may be in the age of students. Grade seven students often are involved in rotary subject patterns for the first time. They may see the experiences as encouraging self-control and self-discipline thus leading them to perceive high developmental press. On the other hand grade eight students were completing their second year in the school and anticipating promotion to a high school. Therefore the students may have looked back at the school year and underestimated the level of developmental press. The finding of differences between grades in this study conflicts with the conclusions reached by Wright (1970) who found no differences. Different organizational patterns between the schools in the two studies could explain some of the discrepancy. The use of a more recent instrument with more sophisticated factors probably allowed the current researchers to detect differences. In practical overtones, one could question the actual school programs in the present study and ascertain if sufficient change was apparent between the grade seven and grade eight classes.

The sex differences of students did not contribute to significant findings in perception of press. As indicated, earlier studies found differences between the press scores perceived by boys and by girls. The findings in this study may reflect the current deemphasis on sex-role stereotyping. An earlier study by Walsh (1977)

found differences in the self-concept of boys and girls in environments similar to those in this investigation. Although one could infer that this affects perception, it may be that the relationship between self-concept and perceptions of environment are less marked according to the sex of students. All students in the present study were following similar programs. There was no attempt to separate any classes on the basis of sex. It appears that our finding of no significant differences strengthens the validity of the CEI to discriminate among classrooms.

The last two hypotheses predicted no differences in perception of press among schools nested within either high SMP or low SMP. As indicated earlier, these hypotheses were not supported. One study reported by Winfrey (1963) supported the findings of the present investigation. His data were collected in high schools in Minnesota. The significant findings of between-school differences within high and low SMP suggest a need to examine individual schools for variables that were not controlled in the present study.

Although it has been suggested that the Profile of a School and the CEI are in some respects both measures of organizational climates there is evidence to indicate that they are measuring different variables. The Likert instrument measures organizational components such as decision-making strategies, communication processes, and motivational techniques. On the other hand the CEI is a measure of affective relationships. It does not imply the existence of managerial strategies or specific organizational practices. This aspect was confirmed in a paper presented by Stern and Walker (1973). Therefore it is apparent that major differences exist between the Profile of a School and the CEI scales.

Conclusion

Rensis Likert's generalized model of the administrative process has proven useful in studying various aspects of school organization. He has suggested that schools with system three or four management patterns demonstrate processes necessary to effect quality decisions. This study was an attempt to demonstrate that intermediate schools which implement the processes suggested by Likert should create a positive learning environment. The need-press model developed by Stern and Walker was utilized as a criterion measure. A relationship between high SMP and developmental press was hypothesized and substantiated. The results suggest that leaders may have an indirect influence on organizational effectiveness. Using the Likert model this influence is transcribed from causal through intervening to end-result variables. The model provides a much-needed framework which enables researchers to investigate the complex relationships prevalent in schools. Thorough study of the Likert writings will enable administrators to devise strategies for implementing a High School Management Pattern organization. Results of this study suggest that the implementation of such strategies could lead to an improved environment for students.

References

Appleberry, J. B., & Hoy, W. K. The Pupil Control Ideology of professional personnel in open and closed elementary schools. *Educational Administration Quarterly*, 1969, *5*, 74-85.

Bishop, L. K. *Individualizing educational systems.* New York: Harper and Row, 1972, 220.

Carlson, J. E. *Full rank multivariate linear model computer program.* University of Ottawa, 1979.

Carlson, J. E., & Tim, N. H. *Full rank univariate linear model computer program manual.* University of Pittsburgh, 1974.

Combs, A. W. An educational imperative. The human dimension. In M. M. Scobey & G. Graham (Eds.), *To nurture humaneness: Commitment for the 70's.* Washington: ASCD, 1970, 185.

Donnelly, B. *The relationship between school management patterns and environmental press on students in grades seven and eight.* Doctoral dissertation, University of Ottawa, 1980.

Fiedler, F. E. *A theory of leadership effectiveness.* New York: McGraw-Hill, 1967.

Garland, P. *The effect of principal-teacher interaction on secondary school environments; an empirical study.* Unpublished doctoral dissertation, University of Ottawa, 1973.

Garland, P., & O'Reilly, R. The effect of leader-member interaction on organizational effectiveness. *Educational Administration Quarterly*, 1976, *12*(3), 9-30.

Likert Associates. The Likert profile of a school, New survey instruments for public schools to improve organizational effectiveness, *Manual for questionnaire use.* Ann Arbor, Michigan, 1972, *14.*

Likert, R. *New patterns of management.* New York: McGraw-Hill, 1961.

Likert, R. *The human organization. Its management and values.* New York: McGraw-Hill, 1967.

Likert, R. *New ways of managing conflict.* New York: McGraw-Hill, 1967.

Likert, R. Past and future perspective on System 4. Paper presented to the Academy of Management Conference, Orlando, Florida, August, 1977.

Likert, R. Evidence of the effectiveness of system in school administration. *Research Report.* Ann Arbor, Michigan: Likert Associates, 1978.

Likert, R., & Siepert, A. The Likert profile of a school measures of the human organization. Paper presented to the American Educational Research Association, New Orleans, February, 1973.

MacKillican, W. *An empirical study of the relationship between school management patterns and the change toward classroom openness.* Unpublished doctoral dissertation, University of Ottawa, 1975.

Murray, H. A. *Explorations in personality.* New York: Oxford University Press, 1938.

Stern, G. S. *People in context.* Toronto: John Wiley, 1970.

Stern G. S. Self-actualizing environments for students. *School Review*, 1971, Winter.

Stern, G. S., & Walker, W. J. The measurement of classroom environmental press. Paper presented to American Educational Research Association, New Orleans, February, 1973.

Walsh, A. J. K. *A descriptive analysis of self-concept of middle high school students in Michigan.* Unpublished doctoral dissertation, Michigan State University, 1977.

Weinstein, G., & Fantini, M. (Eds.). *Toward humanistic education: A curriculum of effect.* New York: Praegar Publications, 1970, 28.

Winfrey, J. K. *The appraisal of institutional press as perceived by selected groups of Minneapolis area high school students.* Unpublished doctoral dissertation, University of Minnesota, Minneapolis, 1963.

Wright, W. R. *Environmental press as perceived by high school students.* Unpublished doctoral dissertation, Purdue University, Lafayette, 1970.

The Alberta Journal of Educational Research *Vol. XXIX, No. 1, March, 1983, 46-53*

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The Effects of Principal Participation in Curriculum Implementation: Support from an Evaluation of a New Mathematics Curriculum

Curriculum writers often find putting ideas on paper much easier than mapping them into teachers' programs. Contextual factors influence outcomes of curriculum changes in unpredictable ways. One such factor surfaced in an investigation to measure the effects of implementing a new grade 6 mathematics curriculum across the 61 schools of one school board. Analysis of gains in student achievement scores revealed a positive effect of the new mathematics program but also a Program x School interaction. Evidence is presented that the more involved the principal was in the adoption process of the new curriculum, the more the school utilized mathematics consultants and the more the students gained in achievement scores from pretest to posttest. Analysis of extreme values strengthens the interpretation that the principal's leadership is a key factor in a school's performance.

Identifying and anticipating the factors influencing curriculum implementation requires paramount consideration if new programs are to be adopted into the

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classroom successfully. Patterson and Czajkowski (1979) have observed that curriculum changes are not fully integrated into the classroom because the change agent does not adequately attend to implementation.

The problem of curriculum implementation appears to be a universal one, judging from the numerous studies that have addressed themselves to this issue (Frey, 1979; Mahan, 1972; McNeil, 1977; Nachtigal, 1972). Irrespective of which model curriculum developers have chosen to modify, it is clear that there has often been a lack of attention given to the implementation phase (Berman, 1977; Loukes, 1979; Mann, 1978; Patterson & Czajkowski, 1979). Unused curricula are skeletons in the closets of many boards of education. The less than satisfactory adoption of new ideas may not necessarily be in the quality of the new programs but rather in the superficiality of their implementation.

Effects of Principal's Leadership on Pupil Achievement

Articles on the implementation process abound in current educational research. Since the comprehensive Fullan and Pomfret (1977) review, we have seen books and articles in large numbers (e.g., House, 1979). Attention has been focussed, appropriately, on the principal players — teachers, curriculum consultants, and, where present, characteristic leaders (House, 1979, p. 3). There are so many players in any large curriculum implementation, however, that influences and roles will always be difficult to detect.

One such large effort was a change to a new core mathematics curriculum at the grade 6 level across 61 schools in one school board in southwestern Ontario. The curriculum work and the evaluation of the change has been reported elsewhere (Pravica, 1977). One outcome of that evaluation was evidence of a continuum of leadership from the principal in such a change (inactive to continual involvement and support) and a detectable influence of that leadership on pupil achievement.

The Curriculum Change and Evaluation

A new core mathematics program was written, field tested, and prepared for implementation during the 1974-75 school year. Teachers were introduced to the program of study during professional development days in the latter part of June 1975, when they were given the opportunity to examine the material critically and to discuss concerns. The program was introduced in all schools in the 1975-76 school year. Consultants were available during the school year to assist teachers in the adoption process.

To evaluate the new program, the entire population of grade 6 students was tested in May 1975 (pretest) and all the following year's grade 6 students in May 1976 (posttest), using specially developed criterion-referenced multiple choice item tests designed to be sensitive to outcomes of the new curriculum (Pravica, 1977). This involved 3825 students in May 1975 and 3865 students in May 1976 (with a parallel test).

The Dominion Learning Capacity Intermediate Level Form A and the Canadian Test of Basic Skills (CTBS) were also administered to the two successive grade 6 cohorts. The mean I.Q. score for the pretest group was marginally, but significantly, higher ($t=4.04$, df$=6983$). No significant differences between cohorts were found either on the CTBS Test of Basic Math Concepts ($t=1.65$) or Problem Solving ($t=1.68$). The 1975 cohort scored significantly higher

on the Modern Math Supplement ($t=3.24$). Since the 1975 "pretreatment" group was statistically similar, or perhaps slightly superior with regard to intelligence and achievement in mathematics, and since there had been no obvious demographic or social changes during the period 1974-76, the new mathematics program remained a plausible explanation for any changes in mathematics achievement from 1975 to 1976.

Pretest-posttest differences were subjected to a nested analysis of variance, with Region and School-within-region as factors and pupils within schools as the unit of analysis. The results appear in Table 1. The mean scores (Table 2) confirm that students who attended grade 6 after adoption of the core program scored significantly higher on the special tests than students in grade 6 the previous year.

TABLE 1

ANALYSIS OF VARIANCES FOR THE NESTED DESIGN COMPARING STUDENT ACHIEVEMENT SCORES BEFORE AND AFTER IMPLEMENTATION OF THE CORE PROGRAM [a]

Source of Variation	SS	df	MS	F	
Program	10812.18	1	10812.87	11.01	S
Region	10043.56	2	5021.78	5.11	S
School (Region)[d]	52050.12	53	982.97	3.08	S
Program x Region	393.18	2	196.90	0.61	NS
Program x Schools (Region)[c]	16890.56	53	318.69	4.88	S
Error[b]	459954.75	7047	65.70		

[a] Achievement scores before implementation of Core Program, "Program I", and after implementation of Core Program, "Program II."

[b] Error term for Program x Schools (Region), taking schools as random with Region and Program as fixed.

[c] Error term for Program x Region and School (Region).

[d] Error term for Program and Region.

Given the large number of schools (61), the significant Program x School interaction could not be readily explained. There was no significant interaction effect between program and region, indicating that program changes had relatively the same effect for all three regions, but the significant School x Program interaction indicated non-chance differences in achievement gains from school to school.

Cholvat (1974) provided the initial clue and a direction for the investigation. His findings indicated that teachers perceived the principal to be the key person for successful translation of the new program into classroom practice. The large number and relatively homogeneous nature of the county's schools discouraged search for an explanation in terms of socioeconomic differences among schools.

TABLE 2

SCHOOL MEANS AND STANDARD DEVIATIONS BY COHORT FOR SCORES ON THE TEST OF MATHEMATICS ACHIEVEMENT DESIGNED TO BE SENSITIVE TO OUTCOMES OF THE NEW CORE CURRICULUM

Individual Schools	Cohort 1 1975 (Pretest)		Cohort 2 1976 (Posttest)		Individual Schools	Cohort 1 1975 (Pretest)		Cohort 2 1976 (Posttest)	
	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.
1	35.79	6.16	35.76	11.45	32	34.69	6.32	34.49	8.15
2	27.98	7.90	30.03	7.19	33	35.32	7.39	40.88	5.90
3	33.53	7.88	39.77	5.79	34	25.81	7.48	36.00	9.22
4	31.29	7.96	31.63	9.67	35	34.05	6.74	38.49	8.02
5	38.02	7.55	37.60	8.09	36	33.45	7.57	30.90	8.10
6	32.40	7.73	34.17	7.04	37	32.72	9.18	32.40	8.67
7	29.04	7.85	39.31	5.86	38	31.57	6.44	28.21	5.37
8	28.74	7.29	32.72	8.86	39	30.69	8.15	32.86	8.19
9	32.22	6.75	32.22	7.06	40	31.54	8.29	36.40	7.64
10	29.83	9.98	28.49	8.17	41	37.32	7.74	39.11	5.79
11	32.14	8.34	37.21	7.47	42	33.55	7.27	36.64	7.96
12	31.33	8.25	32.53	8.20	43	35.52	9.13	36.42	6.81
13	33.81	7.04	35.71	7.54	44	32.31	7.55	42.13	6.83
14	32.03	7.05	36.71	6.19	45	29.55	8.89	31.59	8.96
15	40.62	5.47	38.47	8.46	46	28.64	8.42	37.33	6.70
16	32.09	8.54	30.29	8.80	47	28.79	7.85	29.40	7.32
17	26.94	6.34	34.17	6.18	48	27.97	6.71	28.68	8.12
18	35.31	8.04	37.88	6.48	49	29.83	7.58	38.56	6.35
19	31.82	7.11	33.28	4.84	50	21.36	7.80	29.08	8.56
20	34.69	7.85	37.15	7.90	51	34.35	8.18	32.56	6.63
21	30.19	7.67	28.43	7.86	52	29.70	7.70	31.45	9.43
22	32.68	8.27	33.13	8.31	53	25.66	8.66	32.55	9.29
23	33.18	6.88	39.67	6.94	54	26.51	7.39	28.65	7.13
24	34.41	7.80	35.79	6.41	55	30.44	7.40	34.41	8.95
25	35.57	6.50	38.08	7.36	56	24.47	9.02	30.64	7.31
26	35.90	7.83	34.53	6.87	57	30.48	6.35	35.58	7.21
27	31.42	7.27	39.69	7.61	58	33.85	8.08	35.33	8.02
28	34.75	7.88	37.06	7.66	59	23.77	6.40	28.14	7.48
29	33.85	7.79	33.50	8.15	60	32.34	8.34	32.00	9.74
30	32.34	8.47	34.70	7.65	61	32.29	7.87	33.56	7.23
31	35.32	10.67	38.21	7.89	Schools Combined	31.86	8.46	35.96	8.91

Search of the Literature

The idea that the success of new programs might be linked to strong leadership is not exactly new. Nachtigal (1972) suggested that the most successful adoptions (of new programs) occurred where the director was present and supportive throughout the planning to adaptation phases. Frey (1979) observed that a new program is more likely to survive if someone feels responsible for it, and Mahan (1972) identified the principal as the key to successful adoption of new programs. "Teachers teach more of a new curriculum in schools where the principal played an active role in learning about the curriculum" (Mahan, 1972, p. 153). McNeil supported this claim by indicating that "new curricula do not flourish when the principal remains in his office, verbalizes support, and lets the teacher struggle with the problems" (McNeil, 1977, p. 129).

Follow-up Procedure

Instrumentation was developed to gather data regarding the degree to which principals and consultants were actively involved in the implementation phase within the schools. A semantic differential ten-point rating scale was used, a score of 1 signifying that the principal was not active in the process and a score of 10

that he or she was totally active and supportive throughout 1975-1976. All grade 6 teachers were questioned individually by one of the consultants. Teachers were asked to respond to three questions relative to the 10-point scale: To what degree did you feel that your principal (i) participated in implementation meetings and was actively involved in the discussions and activities, (ii) was accessible and willing to listen to concerns and participate in program planning with individuals or in groups, and (iii) gave support to and acted on your concerns?

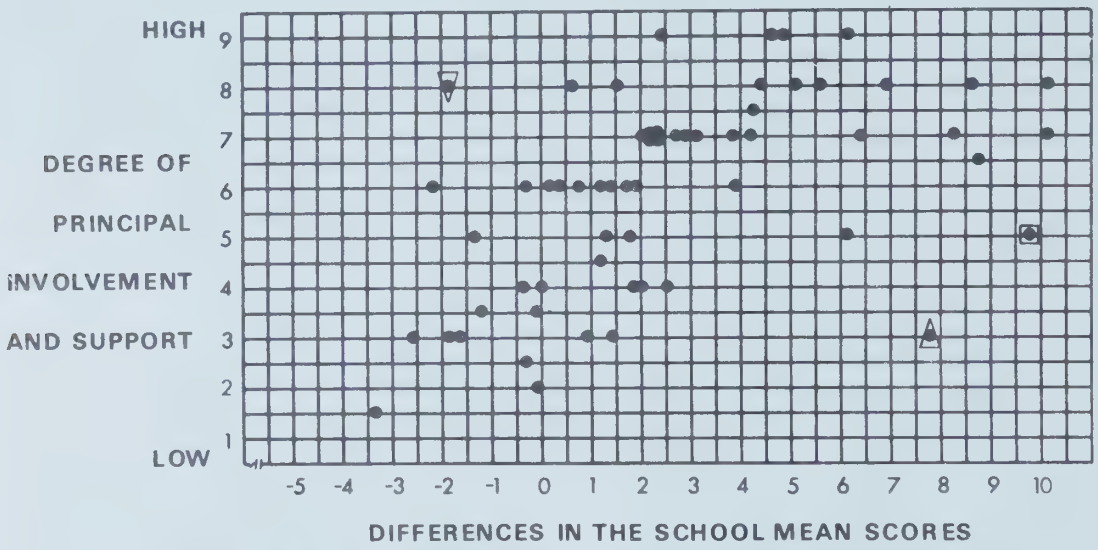

Figure 1. Differences in school mean scores $(\bar{X}_{1976} - \bar{X}_{1975})$ plotted against perceived principal involvement and support.

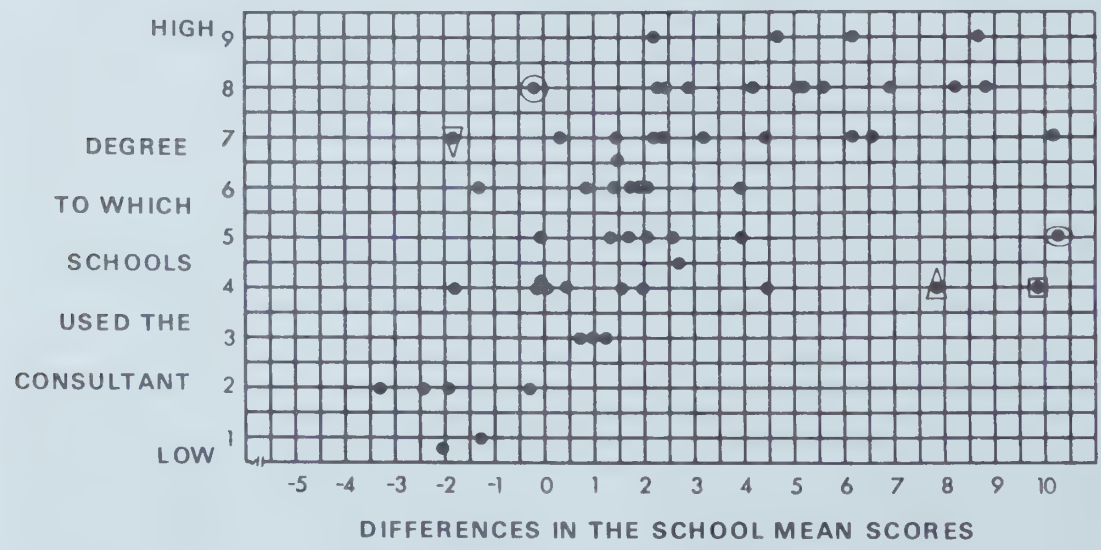

Figure 2. Differences in school mean scores $(\bar{X}_{1976} - \bar{X}_{1975})$ plotted against the degree to which schools made use of the consultant.

The median of the combined scores was obtained for each school. A standardization of these scores was required. This was provided by the consultants who produced a rating based on a more global perspective. Individually, they

rated each principal with respect to perceived participation at implementation meetings and the degree to which the principal acted on teachers' concerns. The final rating score was an average of the median score and the consultants' scores.

Consultants' records of visits to schools provided data on frequency of use of consultants.

Figure 1 is a plot of each school's mean score difference ($\bar{X}$posttest – $\bar{X}$pretest) against the rating assigned to the principal. Figure 2 is a plot of the same mean score difference against the frequency that a school employed the services of a consultant (also converted to a 10-point scale).

A correlation of 0.49 was obtained for the full set of data in Figure 1 and 0.53 for Figure 2 ($p<.01$) in both cases. If one removes the extreme values identified by the geometric shapes enclosing the points in question, the correlations increase to 0.64 and 0.77 respectively. The extreme values are themselves of interest, as seen below.

Summary and Discussion

The analysis presented in the tables and figures supports the notion that the more the principal was actively involved in the implementation process of a new program in the school, the better the students performed on the new test (note that in some schools, cohort 2 scored lower than cohort 1). The significant interaction signals the presence of unequal gains among schools and the figures give structure and meaning to the unevenness.

There is also a plausible link between Principal involvement and use of consultants, the similarity of Figures 1 and 2 are consistent with such a link. An active principal may be the one to involve the consultants and an inactive one to discourage it. Identification of schools on the fringes of both scattergrams revealed that they were the same schools. Additional investigation revealed that the school marked by the inverted triangle (low achievement, high initiative, and use of consultants) has a history of low achievers. The staff of the school indicated that the students attending the school were generally from a community where the socioeconomic level was low and that a large segment of these students would be new to the school, arriving from K-5 feeder schools. It seems unlikely, but perhaps there were more powerful forces operating in this one school than could be overcome by either the principal's initiative or curriculum implementation.

The school marked by the standard triangle (high achievement, low initiative, and use of consultants) was headed by a principal who was to retire at the end of the school year. According to consultants, the principal gave an enthusiastic staff considerable latitude in the development and implementation of school programs. The school indicated by the rectangle was also reported to be staffed by a group of especially enthusiastic teachers. One of the staff members had a good academic background in mathematics and was enthusiastic about teaching mathematics. She provided excellent leadership that might have been sought from consultants. The principal also gave this staff considerable latitude in developing and implementing programs in the school. These data suggest that leadership in implementation is essential. It frequently comes from the principal but may also come from others.

Cost conscious administrators may tend to downplay teacher needs. In times of economic austerity, curriculum planners must also consider that there are "diminishing returns" in learning opportunities. That is, there is a level of educational attainment beneath which dollars invested show a return in student

progress (McNeil, 1977). The point at which "diminishing returns" is reached may be viewed differently by administrators than by teachers. Principals who closely monitor the progress of the new programs are in a better position to recognize and respond when resources or support are needed (and thus earn a high rating). This notion is supported by Frey when he states, "Too often programs die because consumable materials are not replaced or broken equipment is not repaired. Someone must assume responsibility for knowing what materials need to be replaced" (1979, p. 209). Loucks puts this responsibility squarely on the shoulders of the principal,

> Our research indicates that what the principal does is critical to success of an implementation effort . . . makes sure equipment and time are available for the new program, provides moral support, legitimizes early failures when they occur. Where this is true, teachers have resolved management concerns; where this kind of support does not come from the principal (who would be rated low), management concerns often run high. (Loucks, 1979, p. 215)

Researchers have argued that innovations should not start from goals perceived from outside the school. Instead, innovations should take each school where it is and use its strengths in fostering disequilibrium, alternatives, raising philosophical questions, and helping in evaluation (McNeil, 1977). Principals who assume a strong leadership position and are concerned with providing students with programs that will enable them to develop their fullest potential would seem to be in the most influential position to effect the activities that McNeil suggests. Where the teacher may perceive needs that reflect classroom concerns, the principal has the advantage of aligning these needs in a global sense with the school community as the unit. The data discussed in this paper provide empirical support for the often argued notion that the principal is a key factor in initiating and bringing about school change.

References

Berman, P., McLaughlin, M. W., et al. *Factors affecting implementation and continuation.* Federal Programs Supporting Educational Changes, Vol. VII, Rand Corp., Santa Monica, 1977, ERIC ED 140 432.

Cholvat, J. *Every teacher's survey.* Report to the Halton Board of Education, 1974.

Frey, W. P. How to keep those new programs alive and well. *Educational Leadership*, 1979, *37*(3), 208-210.

Fullan, M., & Pomfret, A. Research on curriculum and instruction implementation. *Review of Educational Research*, 1977, *47*(2), 335-397.

Harms, T. Change agents in curriculum. *Young Children*, 1974, *29*, July.

House, E. R. Technology versus craft: A ten year perspective on innovation. *Journal of Curriculum Studies*, 1979, *11*(1), January-March, 1-15.

Hull, R. A research development and adoption model. *Educational Administration Quarterly*, 1974, *10*(3), 33-45.

Loukes, S., & Pratt, H. A concerns-based approach to curriculum change. *Educational Leadership*, 1979, *37*(3), 212-215.

Mahan, J. M. Frank observations on innovation in elementary schools. *Interchange*, 1972, *3*(2-3), 144-160.

Mann, D. (Ed.). *Making changes happen*? Teachers College Press, Columbia University, 1978.

McNeil, J. D. *Curriculum: A comprehensive introduction.* Boston: Little, Brown, and Company, 1977.

Nachtigal, P. A foundation goes to school. In J. D. McNeil, *Curriculum: A comprehensive introduction.* New York: Ford Foundation, 1972.

Patterson, J. L., & Czajkowski, T. J. Implementation: Neglected phase in curriculum change. *Educational Leadership*, December, 1979, 204-202.

Pravica, S. *Effects of implementing a year 6 core mathematics program as revealed in student achievement scores.* Ed. D. Qualifying Research Paper, O.I.S.E., 1977.

Shiman, D. A., & Lieberman, A. A non-model for school change. *The Educational Forum*, 1974, *38*(4).

The Alberta Journal of Educational Research *Vol. XXIX, No. 1, March, 1983, 54-74*

PERSPECTIVES

Sex Differences in Performance On Raven's Progressive Matrices: A Review

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Raven's Progressive Matrices (RPM) has become one of the most widely used measures of intellectual ability, being recognised as perhaps the best measure of "g" and being readily adaptable to situations where language, culture, or physical handicap exclude the use of other measures (Kline, 1979). Three forms have been developed — at the lower level of ability the Colored Progressive Matrices (CPM) was developed for use with children, the elderly, and the intellectually handicapped (Raven, 1947). For testing within the normal adult range of ability, the Standard Progressive Matrices (SPM) (Raven, 1939) is appropriate, while for high-level selection, the Advanced Progressive Matrices (APM) has been developed as a timed test (Raven, 1963). All three tests were designed to be used in parallel with a vocabulary scale, the Mill Hill Vocabulary Scale (MHV), in order to give measures of nonverbal and verbal ability when required (Raven, Court & Raven, 1977).

The original norms for Raven's Progressive Matrices (RPM) were based on the assumption that there are no significant sex differences in performance (Raven, 1939). Neither the theoretical basis nor the standardization procedures of the RPM could provide unequivocal evidence to the contrary, but evidence from studies spread over 40 years is now available.

Spearman's (1923) statements regarding sex differences are inconclusive and contradictory. He claimed that there is no evidence for a superior level of the innate "g" factor in either of the sexes, yet on tasks of general ability males are

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superior to females on tasks involving eduction of spatial relations and correlates and male performance is more variable than that of females (Spearman, 1932).

Raven (1939, 1948) similarly placed little importance on the question of sex differences in RPM performance. On the basis of results obtained in SPM standardization procedures he did not consider it necessary to prepare separate norms for males and females. He stated:

> There was no significant difference, either in the mean scores or the variance of scores, between boys and girls up to the age of 14 years. There were insufficient data to investigate sex differences in ability above the age of 14. (Raven, 1939, p. 30)

In a later article concerning the same subjects, a similar comment is made: "There were no consistent differences between the test scores obtained by boys and girls" (Raven, 1948, p. 14). In this latter article it is shown that there were no significant differences between male and female university students, but sampling problems made it difficult to test the possibility of sex differences in the population over 25 years of age.

While the original research studies indicate that sex differences are not important with RPM, the subject has received a great deal more attention in recent years. As studies have accumulated dealing with varying ages, levels of ability, and ethnic and social backgrounds, conflicting evidence has come forward on the importance of sex differences.

Many published studies which allude to sex differences are inconclusive since they have only examined such differences as a matter peripheral to other concerns. As a result, careful sampling cannot be assumed. Some studies claiming to report positive results are based on numerically small and inadequate samples, and a number, while claiming to find effects, fail to indicate whether the results reach acceptable levels of statistical significance.

Since the various forms of RPM were developed for rather different purposes, one may hypothesise that findings with CPM could well be different from those using either SPM or APM. Even though all three series rely on the sample principles for their solution, the levels of operation are very different. Different age-groups, cultures, and parts of the intellectual spectrum are involved. As the evidence below indicates, such factors do bear on RPM performance. Hence the most convenient way to approach the results is to examine CPM, SPM, and APM separately.

1. *Studies with Standard Progressive Matrices (SPM)*

Table 1 summarizes those studies which have used the SPM and found some sort of sex differences in performance, whether it be in favour of males or females on means or variability. Table 2 summarizes those studies which have utilized the SPM and discovered no sex differences.

There are various technical difficulties associated with these studies which must be identified before conclusions can be drawn from them.

Over half of the studies presented in Table 1 did not include tests of statistical significance for the sex difference results obtained. Some studies reported finding evidence of sex differences in discussion of results, but did not report data or comment on statistical significance. Other studies provided results with scores for both sexes and made no further comment on the significance of the differences

TABLE 1

SPM: SEX DIFFERENCES

	Name	Date	Country	Subjects	Results
1	Eysenck*	1943	Britain	Adult, Neurotic	Females superior to males on SPM Means–results statistically significant
2	Himmelweit	1946	Britain	Adult, Neurotic Service people	Females superior to males on SPM Means. Females also showed higher variability on SPM Scores. Female M - 40.65 SD - 8.25 Male M - 36.36 SD - 7.48
3	Rimoldi*	1947	Argentina	Children, 9-15 years	Males superior to females on SPM Means, only in older age groups. ($p<.01$)
4	Orton & Martin	1948	Britain	Prospective Medical Students	20 min. Timed version of SPM differences not tested for statistical significance. Female M - 50 SD - 3.0 Male M - 49 SD - 4.6
5	Johnson*	1952	U.S.	Retarded children 9.6 - 16 yrs.	Males superior to females on SPM Means. Females showed more variability than males. Higher individual variability for males than females. Results statistically significant.
6	Lingwood	1952	Britain	Shop assistants and Clerical workers 20-29 years	No sex differences on SPM Means in either group. Shop assistant males showed higher variability than females.
7	Arblaster & Jessop	1957	Britain	T.B. Patients	Sex differences in numbers of patients above and below SPM Medians, in minimum and extensive disease patients.
8	Morgan	1957	Wales	301 boys, 347 girls aged 10-12 yrs. varying degrees of bilingualism	Females slightly superior to males in most bilingual categories, but mean differences insufficient to justify separate consideration.
9	Valentine	1959	Iran	Secondary school students	Males superior to females on SPM Means.
10	Young et al.	1962	Italy	Children, 6th-8th grade	City children: males superior to females in SPM Mean Scores. Country children: females superior to males in SPM Mean Scores.
11	Foulds & Dixon*	1962	Britain	Schizophrenics & Neurotics	In both diagnostic groups males superior to females on SPM Mean Scores. Differences statistically significant.
12	Foulds et al.*	1962	Britain	Schizophrenics	Males, in all diagnostic groups superior to females on SPM Means. Differences statistically significant.
13	McLeod & Rubin	1962	Canada	Neurotics	Mean and variability Scores for males greater than for females.
14	King*	1963	Britain	Children, 5.25-17.33 yrs.	Significant sex difference in favour of females on SPM Means for total subject group.
15	Siegel	1963	U.S.	Children, 9-18 years	Sex differences in types of errors made on SPM
16	MacArthur, Irvine & Brimble*	1964	Rhodesia	Standard 6 & Form II students	Males superior to females in Standard 6 ($p<.05$). No difference with Form II. No difference on variability.
17	Sitkei & Michael	1966	U.S.	Subjects, 16-49 years	Males slightly superior to females on SPM Means. Male X - 37.5 Female X - 35.6
18	Bruni	1966	Italy	Secondary school students	Technical schools: Males superior to females on SPM Means. Females more variable than males.
19	Heron & Chown*	1967	Britain	Adults	Normative study. Males superior to females ($p<.01$) on timed SPM. Differences less with older groups.
20	Klingelhofer*	1967	Tanzania	Secondary School students	African students: No sex differences, except in Form 3 where females superior on SPM Means. Asian students: Males superior on SPM Means in Form 2, and for all forms combined. Differences statistically significant.

TABLE 1 (continued)

	Name	Date	Country	Subjects	Results
21	Sydiaha	1967	Canada	Adult Psychiatric patients	No significant sex differences in SPM Mean Scores. Variability Scores as follows: Male SD - 11.1 Female SD - 9.6
22	Sinha	1968	India	Children 12-14 years & University students	Males: Rural 12 yrs. 22.50, 13 yrs. 26.50, 14 yrs. 27.10; Urban 12 yrs. 24.00, 13 yrs. 27.40, 14 yrs. 29.10. Females: Rural 12 yrs. -, 13 yrs. 36.83, 14 yrs. 30.00; Urban 12 yrs. 25.50, 13 yrs. 28.90, 14 yrs. 30.10. Females slightly superior to males in all groups on SPM Means.
23	Vejleskov*	1968	Denmark	Grade 5 children	Males work faster than females on SPM. Female performance superior, especially on Set D, for one school of two ($p<.05$).
24	Wiltshire & Gray	1969	Canada	Reserve Indians 7-15 years	No significant sex differences on SPM Mean Scores. Females showed significantly higher variability than males.
25	Foulds*	1970	Britain	Psychiatric Adults	7 out of 8 worst groups tested on SPM were female. 4 best groups were male. Differences statistically significant. No sex differences in time taken to complete test.
26	Georgas	1970	Greece	Children, 6-12 years	Males superior to females on SPM Means in 10, 11, and 12 year old age groups.
27	Kear-Colwell	1970	Britain	Psychiatric Adults	Males superior to females on SPM Means. Male X - 44.8 Female X - 41.6
28	Stachyra	1971	Poland	40 deaf, 40 controls aged 14, half of each sex	Males superior to females.
29	Mohan*	1972	India	College & University students	Males superior to females on SPM Means Male X - 46.48 Female X - 43.88 ($p<.01$)
30	Mohan & Kumar	1973	India	100 students aged 18-25 yrs.	Males superior to females.
31	Valseschini & Delton	1973	Italy	Subjects 11-60 years	Males superior to females Male 50th centile = 36 points Female " " = 30 points
32	Baraheni	1974	Iran	2355 girls, 3206 boys, aged 9-18 yrs.	Boys superior to girls up to age 13 and at age 16.
33	Szegedi	1974	Hungary	300 Budapest inhabitants, aged 15-60 yrs.	Differences between sexes found but "merely accidental" and unsystematic.
34	Rao*	1975	India	1025 boys, 1019 girls, aged 15-18 yrs.	Males superior to females and with higher variability except at age 17. An age x sex interaction reported.
35	Mohan & Bhanot	1976	India	60 children	Males superior to females on subsets and total scores.
36	Nathan & Schnabl*	1976	Israel	776 kibbutz-born children, aged 11-18 yrs.	Males superior to females at ages 15-18. Females superior at ages 11-13. No difference at age 14.
37	Vandenberg & Price	1978	U.S.	167 males, 210 females, ages <20 to 60+	A gender rather than a sex difference: subjects scoring high on masculinity also scored higher on SPM even with sex partialled out.

* Sex difference results tested for statistical significance.

between these scores. Only those studies marked with an asterisk actually tested the differences for statistical significance. Had many of the non-asterisk studies been subjected to tests of statistical significance, they would probably have concluded that no significant sex differences existed in the sample investigated.

TABLE 2

SPM: NO SEX DIFFERENCES

	Author	Date	Country	Type of Subjects
1	Raven	1939	Britain	Children to 14 years and University students
2	Rimoldi	1945	Argentina	Children 7-14 years
3	Chauffard	1949	France	Children 9-14 years, from two socioeconomic status levels
4	Levine & Iscoe	1954	U.S.	Undergraduates: Mean age 19 years 1 month
5	Crawford	1955	Britain	Children, 7 yrs. 5 months to 10 years
6	Levine & Iscoe	1955	U.S.	Deaf students, 15-19 years
7	Elley & MacArthur	1962	Canada	Grades 6 & 7 children
8	Arian et al.	1962	Italy	Psychiatric patients, 65-80 years
9	Tesi & Young	1962	Italy	3432 students, 10¼-16¼ yrs., a 4% population sample
10	MacArthur	1965	Canada	White, Indian and Eskimo students. A normative study, 10-14 yrs.
11	Montgomery	1966	Britain	Grade 3 Deaf children - 20 min. Timed version of SPM used
12	Wetherick	1967	Britain	University students
13	Tulkin & Newbrough	1968	U.S.	Negro & White children, 5th and 6th grade
14	Di Fiore & Renda	1969	France	Apprentices and college students
15	MacArthur	1969	Canada	Eskimo, White and Indian children, 9-12 years
16	Brandis & Henderson	1970		Over 600 subjects
17	Petersen	1971	Australia	Secondary School students, 14-17 years
18	Langevin	1971	Canada	269 6th graders; mean age 11 years 8 months
19	Bartlett, Newbrough & Tulkin	1972	U.S.	356 5th graders
20	Kennedy	1972	Australia	159 secondary school students, aged 14-16 years
21	Alonso	1973	Cuba	A normative study with school and preuniversity students, aged 6-12 years
22	Byrt & Gill	1973	Eire	3464 Primary School children, aged 6-12 years.
23	Chang	1975		100 4th graders and 80 6th graders. Boys better on reasoning tasks and this correlated with SPM, but no sex difference per se reported.
24	Simon & Ward	1975	Wales	60 11-12 yr. olds and 60 14-15 yr. olds, equally male and female in a study of relationships of age, sex, intelligence and religious beliefs.
25	Chang	1976		284 4-6th graders, half taught by a male, half by a female
26	Gill	1976	Eire	3500 children, 6-12 yrs. No combination of predictors, including sex, could explain more than 7% of SPM variance
27	Mohan & Kumar	1976	India	100 students aged 18-25 years
28	Sweet	1976	Australia	Normative study of 1000 adolescents
29	Ghuman	1977	Wales	60 11-12 year olds, middle and working class. Apparently no significant differences found.
30	Kanekar	1977	India	71 male, 101 female undergraduates
31	Marjoribanks	1978	Australia	240 girls, 260 boys, 6th grade from 15 elementary schools, aged 10.8-11.5
32	Surrey Educational Authority	1978	Britain	11,621 12 year olds
33	Conrad	1979	Britain	254 males, 246 females, deaf school leavers. No difference between sexes or for a sex x hearing loss interaction
34	Mohan & Kumar	1979	India	400 students aged 19-25 years
35	Raven	1981	Britain	Standardisation sample, aged 6-15; 1668 boys; 1591 girls. Brief advantage for girls at age 11 to 11½.

A second technical problem concerning the research listed in Tables 1 and 2 relates to experimental flaws. Sample bias favouring one sex may have generated the sex difference results obtained; in other studies there are signs of important interactions with variables such as age, social class, and cultural norms. Nine of the studies in Table 2, which found no sex differences, were on populations of high secondary or tertiary students (Raven, 1939; Levine & Iscoe, 1954; Wetherick,

1967; Di Fiore & Renda, 1969; Petersen, 1971; Alonso, 1973; Mohan & Kumar 1976; Kanekar, 1977; Mohan & Kumar, 1979). Assuming that selection procedures for these populations were, at the time of the studies, based in favour of "bright" girls, the generality of the results obtained is in doubt.

Heron and Chown's (1967) data appear to demonstrate sex differences favouring males, but the observed differences are qualified in several ways by the authors. Their view is that "lack of use of abstract problem solving ability speeds its deterioration," and this effect would apply more to women than men, and is consistent with the finding that scores for men dropped off more in the 60-70 age range than for women. Their data were also derived using a timed version of SPM (20 minutes and 40 minutes). Under these circumstances males may be favoured (Vejleskov, 1968). SPM should be administered untimed, and an optimum score is not obtained under timed conditions (Kundu & Sen, 1964).

Rao (1975) examined 15- to 18-year-old students in various types of schools in India. It is consistent with the observation of many that sex role differentiation is firmly established in Indian education, that boys performed better than girls at all the ages tested, except age 17. With educational standard held constant, the difference favouring boys increased with increasing age. Variability of score among boys was also larger.

The importance of sex differentiated educational experiences is noted in another Indian study, that of Mohan and Bhanot (1976). They point to the mathematical nature of the problem-solving task posed by SPM, find a positive correlation between SPM and a mathematical test, and remark that "mathematical and problem-solving situations are essentially associated with masculine role . . . the Indian educational system promotes the growth of certain attitudes which lay emphasis on Algebra and Geometry as being masculine subjects." Their finding of a positive advantage for males has also been reported with other samples by Mohan (1972) and Mohan & Kumar (1973), but not in their more recent studies (Mohan & Kumar, 1976, 1979).

Expectations about the distinctive ways in which the sexes are reared also lie behind positive results from Israel. Nathan and Schnabl (1976) gave SPM to children of different ages being reared in various types of kibbutz. The results were complicated in that girls proved superior at ages 11-13, while boys were superior at ages 15-18, and no difference was found at age 14. The authors express the view that certain types of kibbutz environment favour boys, while others favour girls. They also note that in another Israeli study by Guttman (1974) with a non-kibbutz sample, boys performed consistently higher than girls on SPM.

A further consideration of reasons for positive findings comes from Ziv (1972), who examined the possibility that differences might arise from differentiated reinforcement contingencies for the two sexes. While this did not emerge, they did find a significant interaction between the sex of examiner and examinee. In studying 120 boys and 120 girls examined in Israel by either a man or a woman, Ziv found:

> The man influenced the boys more: the woman had greater influence on the girls. In spite of the man's greater prestige in society as a whole in intersex interaction girls reacted more positively in the woman's presence than in the man's. (p. 117)

The most remarkable aspect of the research summarized in Tables 1 and 2, keeping in mind the technical problems described, is the lack of consistency in favour of either sex and the lack of consistency in the type of results obtained in similar populations. This would lead one to be doubtful of the differences and to look for interpretations in terms of interactions with other variables.

Seven studies in Table 1 report evidence of superior mean scores for females (Eysenck, 1943; Himmelweit, 1946; Morgan, 1957; King, 1963; Sinha, 1968; Vejleskov, 1968; Nathan & Schnabl, 1976). Both Eysenck (1943) and Himmelweit (1946) acknowledge that their sex difference in favour of women in neurotic populations was probably due to the biased selection procedures in favour of "bright" women in the British Armed Forces. King (1963) attributes his finding to the lack of a representative sample. Morgan (1957) considered the observed differences too small to warrant consideration. Vejleskov (1968) obtained significance only for one of two groups of school children who were differentiated mainly by social class, while Sinha's (1968) results are marginal and not tested for significance. Nathan and Schnabl (1976) found the superiority only at ages 11-13, perhaps related to the earlier physical maturity of the female (Tesi & Young, 1962). There is therefore not sufficient evidence here to make a case for a sex difference favouring females.

Of the 37 studies in Table 1 indicating some kind of sex differences, 15 report a difference in means favouring males in relation to all subjects tested, while a further eight studies found such differences in some groups but not others. Of the 15 studies only seven also report tests of statistical significance (Johnson, 1952; Foulds & Dixon, 1962; Foulds, Dixon, McClelland & McClelland, 1962; Heron & Chown, 1967; Mohan, 1972; Mohan & Kumar, 1973; Mohan & Bhanot, 1973). The studies by Johnson and by Foulds deal with clinical populations with no control over sample bias; the Heron and Chown results have been considered above. Mohan's reports provide the most consistent series of studies identifying clear sex differences among Indian students.

With variance, the studies divide rather evenly for the sexes with no convincing evidence for this being greater for either sex.

The discrepancy of sex difference results across similar populations is illustrated well by those studies using psychiatric patients. Six research reports have published evidence of male superiority on SPM means, or increased male variability in psychiatric patient samples (Foulds & Dixon, 1962; Foulds et al., 1962; McLeod & Rubin, 1962; Sydiaha, 1967; Foulds, 1970; Kear-Colwell, 1970). However, Arian, Delogu, Scazella and Zanalda, (1962) report no evidence of sex differences in a group of adult psychiatric patients. The large numbers of British and U.S. studies in both the sex difference and non-sex difference tables also illustrate the discrepant nature of sex difference results. Trends in such studies which appear to favour males may well arise from sample bias in psychiatric populations.

There is a very slight trend for poor or non-Western culture studies to appear in the sex difference table. Sex differences in SPM performance have been found in Argentina (Rimoldi, 1947), Iran (Valentine, 1959; Baraheni, 1974), Italy (Bruni, 1966; Valseschini & Delton, 1973), Tanzanian Asians (Klingelhofer, 1967), India (Sinha, 1968; Mohan, 1972; Mohan & Kumar, 1973; Rao, 1975; Mohan & Bhanot, 1976), Greece (Georgas, 1970) and with American Indians (Wiltshire & Gray, 1969). Young, Tagiuri, Tesi, and Montemagni, (1962) reported sex differences in

an Italian study but a further report of the same study (Tesi & Young, 1962) shows that the differences were not statistically significant. Tesi and Young in fact tentatively offer an explanation of sex differences at the time of the adolescent growth spurt which might account for girls performing better than boys for a year or two. While their data appear to indicate such a possibility, the failure to demonstrate such a differentiation at a statistically acceptable level weakens the case. Raven (1981) found a significant difference favouring girls at age 11 to 11½ only.

Most of these studies do not give statistical evidence on the differences reported. Where they do, they typically find differences in some groups but not others, suggesting that interactions with age and educational opportunity may be more important than any sex differences per se. MacArthur's extended range of studies in Africa and North America led him to conclude in 1969 that, while differential upbringing can result in differences in some abilities including performance on SPM, this is not always so. Evidence in further support of this comes from Mohan's Indian studies, and from Nathan and Schnabl in Israel.

Summarising work over many years and across several cultures, MacArthur (1978) is of the opinion that when sex differences are found, this arises from cultural expectations, such as the encouragement of spatial skills in males and verbal skills in females. Referring to studies of Eskimos and Nsenga Africans he notes:

> One of the striking findings of this study was almost no sex differences in any of the ability tests for any of the age groups in any of the ethnic samples . . . . This sex non-differences finding strongly suggests that on this broad battery of cognitive tasks for these samples such sex-differences as do occur are not likely to be of biological origin, but related, rather, to circumstances in the upbringing of a particular age-group in a particular setting at a particular time. (p. 199)

Most studies cited here did not specifically seek to test for sex differences in any controlled manner, but simply reported results incidentally. Kennedy (1972) therefore undertook a study with the sex variable specifically in mind and concluded that neither means nor variability showed a difference. Similarly the detailed standardization study of Byrt and Gill (1973), which took care of control for social class, failed to find significant sex differences (see also Gill, 1976). In a restandardization study of SPM recently completed, Raven (1981) found sex differences again failed to appear, except briefly at age 11 to 11½.

An interesting aspect of sex differences in SPM performance is the possibility of differences in types of errors made by the sexes. Sigel (1963) analyzed the responses made to Items A7 and B7 of the SPM, by children aged 9 and 10 years. On Item A7 boys and girls differed, not in the number of errors made, but in the kinds of errors. Girls made more errors because of difficulty in perceptual discrimination and Sigel (1963) has suggested that girls at this age are more global in their approach to perceptual problems than boys. On Item B7 boys and girls made a similar error but selected different answers to exhibit it.

A Danish study used fifth grade children to show that girls perform in a fashion superior to boys on Set D (Vejleskov, 1968). Girls are also superior on the last part of Series B, but on Series B, Items 3 to 7, boys appear to be dominant. Richardson (1969) has come to similar conclusions but suggests the differences

may relate to personality patterns rather than sex per se (cf. Mohan & Kumar, 1973). Guttman (1974) has suggested a genetic basis for male superiority on E-8 which involves mental rotation.

These item analysis studies indicate that any investigation into sex differences should look not only at means and variability, but also at types of errors made. A detailed study on these lines has come from Bartlett, Newbrough and Tulkin (1972). They found differences between social class and racial groupings in the ways in which items were analyzed, but no such differences between sexes could be found.

In all the SPM evidence presented, there is no consistent difference in favour of either sex over all populations tested. Table 2, in listing 35 studies which report no difference, includes a number of large and detailed investigations with evidence coming from five continents. The most common finding is of no sex difference. Reports which suggest otherwise can be shown to have elements of bias in sampling, or include other variables which could covary with sex. Cultural factors are among the possible influences, but are most readily examined in relation to CPM studies.

2. *Studies with Colored Progressive Matrices (CPM)*[1]

Norms for the CPM are based on the assumption that there are no significant differences in performance by either sex. The original norming sample of 608 Dumfries children aged 5-11½ years was relatively small, and from a limited geographical area. Raven (1939) reports, "There was no significant difference, either in the mean scores or the variance of scores, between boys and girls up to the age of 14 years."

More recently, MacArthur (1965) developed norms for 751 children in northwest Canada. He concluded that there was no significant difference for the overall sample aged 6½-9½ years, except for a significant difference, at the 0.05 level, favouring boys in the 8-9½ year age group. He wrote, "Analysis of variance indicated no significant differences, so that the boys and girls may be referred to the same set of norms."

Contrarily Rao and Reddy (1968) did not report significant differences when they developed norms from a sample of 1,017 elementary school children in India. Notwithstanding, they published norms separately for boys and girls, by age, for each year from 5 to 10 years inclusive, and by school grade.

Tables 3, 4 and 5 summarize studies which refer to differences in performance on the CPM by boys and girls. While 18 studies failed to find significant differences (Table 3), and a further 7 (Table 4) did not test for significance, there are 17 studies in Table 5 in which significant differences between sexes were found.

Comparison and analysis of the studies cited are, like those for SPM, complicated by several factors. Studies were typically more concerned with such issues as mental or physical handicap, socioeconomic status, or cultural differences, than sex differences per se. The results are therefore complex.

Table 3 presents the results of those 21 studies which found no differences between the sexes on CPM. They seem at first sight to present a fairly clear picture but, in reality, these findings too deserve caution. They cannot all be treated as comparable tests of the performance of CPM.

TABLE 3

CPM SEX DIFFERENCES NONSIGNIFICANT

	Author	Date	Country	N	Type of Subjects
1	Norman & Midkiff	1955	U.S.A.	96	Navaho children, 9 yrs. 6 mths. to 13 yrs. 6 mths.
2	Higgins & Sivers	1958	U.S.A.	789	Negro & White children, 7 yrs. to 9 yrs. 11 mths.
3	Tuddenham et al.	1958	U.S.A.	124	Negro & White children, Grades 3-6.
4	Harris	1959	U.S.A.	98	Kindergarten children. Male M - 16.24 SD - 3.00 Female M - 16.25 SD - 3.8
5	Kuroda	1959	Japan	80	Children, 4-6 years
6	Levinson	1960	U.S.A.	238	Kindergarten and Grade 1 children
7	Malpass, Brown & Hake	1960	U.S.A.	104	Retarded & Normal children
8	Rich & Anderson	1965	U.S.A.	115	Blind children, 6-15 years
9	Payne	1967	U.K.	298	Children, West Indian and English
10	Elkin	1968	Canada	59	Educable retardates, mean ages, 25 males and 34 females
11	Rohwer, Ammon et al.	1971	U.S.A.	288	Children, Kindergarten, 1st and 3rd grade. Low SES Negro, High SES White
12	Deshpande	1971	India	1534	Children, 8-11 years
13	Milgram	1971	U.S.A.	80	Children aged 6-16 years
14	Turner, Hall & Grimmett	1973	U.S.A.	96	Middle and lower class kindergarteners
15	Garrity & Donaghue	1976	U.S.A.	22	Children 5 years old
16	Kerr	1976	U.K.	256	Children, 5-9 years
17	Kurdeck	1977	U.S.A.	96	First through fourth grade children
18	Mills	1978	S. Austr.	233	Children, 9-11 years; 117 boys, 116 girls
19	Molloy & Das	1979	Australia	120	Grade 4 children
20	Myers & Goldstein	1979	U.S.A.	101	Aged 5-12, 40 monolingual, 53 Puerto Rican Spanish/ English speakers, all from poor families
21	Panek & Stoner	1980	U.S.A.	150	Adults aged 20-86 years.

In defining a psychological test as a "standardized measure," Anastasi (1976) says "Standardization implies uniformity of procedure in administering and scoring a test. If the scores obtained by different individuals are to be comparable, testing conditions must obviously be the same for all." She also stresses the importance of a trained examiner.

> An adequate realization of the need to follow instructions precisely, as well as a thorough familiarity with the standard instructions, is required if the test scores obtained by different examiners are to be comparable, or if any one individual's score is to be evaluated in terms of the published norms. (p. 31)

Referring to machine-scorable answer sheets, Anastasi says that these cannot be assumed to be equivalent to those in standardization samples, in the absence of empirical verification.

In this context it should be noted that neither Levinson (1960) nor Harris (1959) record whether the Book or the Board Form was used. Kuroda (1959) in his study of 90 Kindergarten children found, nonsignificantly, that "the percentage of pass on the Board Form was generally higher than on the Book Form."

In Table 4, a series of studies is presented in which authors indicate a sex difference though without providing statistical tests of the differences. The combined trend is towards male levels being superior to those for females. The studies include substantial samples across the age-range for the test, and are

drawn from a variety of populations and countries. Such consensus cannot be disregarded.

TABLE 4

CPM SEX DIFFERENCES: SIGNIFICANCE NOT TESTED

	Name	Date	Country	N	Subjects	Results
1	Bruni	1954	Italy	931	Children 8-11 years	Males in all age groups slightly superior to females on CPM Means. Except in age groups 9 and 11, males had higher variability.
2	Kilburn et al.	1966	U.S.A.	100	Mild Mental Retardates	Male M - 15.22 SD - 4.62 Female M - 14.52 SD - 4.36
3	Cantwell	1967	U.S.A.	727	Children, gr. 2 & 5, 2 SES levels	Males superior on CPM Means in both SES levels
4	Anderson Kern & Cook	1968	U.S.A.	147	Brain damaged subjects 16-65 years	Males superior on CPM Means, especially in low SES groups.
5	Rao & Reddy	1968	India	1017	Children 5-10 years	Developed separate norms for boys and girls. Male M = 15.78 SD = 6.62 Female M = 14.52 SD = 6.00
6	Sinha & Chandrakala	1972	India	50	Children 5-12 years	Male (N=22) M = 17.2 SD = 7.92 Female (N=28) M = 19.1 SD = 6.55
7	Georgas & Georgas	1972	Greece	227	Children 6-12 years	Means M 9.40 9.98 11.15 14.31 18.55 23.52 26.05 F 10.04 10.78 12.07 14.30 16.73 19.13 20.18

In Table 5, the 17 studies finding clear differences support the case for males performing slightly but significantly better in a wide variety of contexts. Comparison of data coming from advanced and developing countries suggests that differences are greater among the latter. Where age differences are also apparent, the trend is towards greater equality in the upper ages (Muller, 1970; De & Kala, 1971) but even this hint of differential development is not supported by the German studies of Eggert (1969) or Winkelman (1972) where significance was not found at younger ages.

It is tempting to seek a single explanation for such differences as have been found, but such parsimony cannot be scientifically justified. Allowing that sex differences do reliably appear in some studies, they have failed to appear in other studies which appear to be at least as competent in their execution and relate to similar circumstances. Unlike the SPM results, the advantage is almost exclusively for males in these studies when it does appear. This raises questions of expectations, sex role stereotyping, and cultural differences in opportunity. Some support for such environmental variables emerges, as in those situations where diverse ethnic groups have been studied (Klippel, 1975; Rawlinson, 1974) but even results such as these deserve caution. Jensen (1971) in seeking those factors which can be identified as contributing to observed sex differences refers to the positive findings of Semler and Iscoe (1966) for blacks and whites in the U.S.A. He comments that "unfortunately because of the relatively small samples used by Semler and Iscoe, we cannot be very confident whether these are *test* differences or *sample* differences" (p. 136).

TABLE 5

CPM, SEX DIFFERENCES SIGNIFICANT

	Name	Date	Country	N	Subjects	Results
1	Sperrazzo & Wilkins	1958	U.S.	480	Negro & White children, 3 SES levels	No significant sex differences in CPM Means. Sex factor only significant in race x age x sex x status interaction.
2	Sperrazzo & Wilkins	1959	Canada	480	Negro & White children 3 SES levels	Males superior to females on CPM Means only in lowest socioeconomic status group ($p<.01$).
3	Klauer	1964	Germany		Children 6-11	Males superior to females except at 7^0 and 9^5.
4	MacArthur	1965	Canada	751	Children 6.5-9.5 yrs.	Males superior to females on CPM Means ($p<.05$). Older groups using SPM: no significant sex differences.
5	Freyburg	1966	New Zealand	159	Children, 5 yrs. 9 mos.-7 yrs. 10 mos.	Males superior to females on CPM Means ($p<.01$).
6	Semler & Iscoe	1966	U.S.A.	275	Negro & White children, 7-9 years	Mean scores: 7 yrs. / 8 yrs. / 9 yrs. White Males 15.83 / 25.20 / 21.42 White Females 15.00 / 22.33 / 22.08 Negro Males 9.42 / 21.85 / 21.75 Negro Females 12.67 / 20.57 / 19.50
7	Eggert	1969	Germany		Retarded children 7-12 yrs.	Males slightly superior overall but not at age 8.
8	Goetzinger & Houchins	1969	U.S.	80	Children, 6.5-8.5 yrs. Hearing and deaf.	Males superior to females on CPM Means in hearing group. No significant sex difference in deaf group.
9	Muller	1970	Germany		Children 6-11	Overall difference favouring males, but significant only at ages 8, 9, and 10 yrs.
10	Berry	1971	Cross-Cultures	496	Subsistence level, Native groups, 10-70 yrs.	Males superior to females on CPM Means, only in sample of 90 Temne Indians where sex role separations are strong.
11	De & Kala	1971	India	833	Children 7-12 yrs.	Males superior to females at age 7-8 yrs. Females superior to males at age 11-12 yrs. No significant difference at age 9-10 yrs.
12	Jensen	1971	U.S.	1007	Children 5.5-12.6, Black & White	Males superior to females, especially among Whites
13	Jensen	1971	U.S.	1236	Children 5.5-12.6, Mexican & White	Males superior to females, but great variability with age.
14	Winkelman	1972	Germany		Children aged 6-11	Small but significant superiority for males except at ages 5 and 7.
15	Rawlinson	1974	Papua-New Guinea & Tasmania	76	Equal nos. from each country, grades 3-6.	New Guinea, males superior to females ($p<.01$). Tasmanians: not significant.
16	Klippel	1975	New Zealand	60	Equal groups of Maoris, Samoans and Pakehas	Sex and ethnicity interaction ($p<.01$). Polynesian males superior to females. Reverse pattern for Pakehas (Europeans).
17	Andersson, Berg, Lawenius & Svanborg	1978	Sweden	181	70 year olds, (77 male, 104 female)	Normally distributed scores for both sexes, with males superior to females ($p<.05$)

Turning then to a large sample of Mexican-Americans compared with whites, a sex difference favouring males was again found, with larger differences for whites than blacks. Leading with the hypothesis that the magnitude of sex difference is a function of the degree of environmental deprivation experienced, Jensen has to conclude finally that "because of the considerable variability of the sex differences among various age groups, no strong interpretation can be made of the data" (1971, p. 136).

The significant results of Andersson, Berg, Lawenius and Svanborg (1978) deserve comment as they are derived from an elderly sample. In a study of urban

70-year-olds, a series of verbal, reasoning, and perceptual tests was given. CPM was discrepant in that it was the only test on which significant differences were obtained. In view of this, the authors have concluded that "the difference between men and women in Raven's Coloured Progressive Matrices is difficult to explain and not in line with the results from other tests" (1978, p. 65).

The German version of the CPM manual carries a review of evidence relating to sex differences which leads one to equally cautious conclusions. After commenting about the heterogeneity of findings, the review concludes that even if there were a consistent difference in favour of boys, the difference is too small to be of practical significance (Schmidtke, Schaller & Becker, 1978).

For most practical purposes, then, it appears that sex differences on CPM can be disregarded. Under some not-well-defined conditions, sex differences can be expected and when these occur they are likely to favour males. Such differences may well be of research significance if identified factors can ultimately be isolated, but they do not justify the production of separate norms for the two sexes. A finding of significant sex differences does not of course necessarily invalidate test findings. Rather, it may well result from the sensitivity of the test to such variables as socio-economic status or ethnicity.

3. *Studies with Advanced Progressive Matrices (APM)*

Very little attention has been paid to sex differences with the APM. The situation can be conveniently summarized by saying that no reason to postulate sex differences at this level has been advanced. Wittenberg (1958) in studying a German random sample found a slight but nonsignificant bias towards males. Van Dam (1976), in a Belgian study of university undergraduates, also found a nonsignificant difference between the sexes.

Discussion

Where sex differences on RPM emerge they relate to other variables. There is support for the importance of cultural expectations for the sexes and for the interaction of examiner's sex with that of the examinee.

At the lower levels of testing, it appears that different strategies may be used to come to correct solutions, with some subjects preferring spatial strategies while others verbalise (Corman & Budoff, 1974; Kirby & Das, 1978) whereas at higher levels more analogical reasoning is involved. Factorial studies (e.g. MacArthur, 1978; Das, Kirby & Jarman, 1979) make it clear that factor loadings for RPM performance vary quite substantially across cultures and that efficient strategies can be learnt.

The accumulated evidence at all ability levels indicates that a biological sex difference cannot be demonstrated for performance on RPM. Indeed, two genetic studies have specifically looked for the possibility of a linkage in spatial tasks, including a slightly modified SPM, and found no evidence for this (DeFries, Johnson, Kuse, McLearn, Polovina, Vandenberg & Wilson, 1979; Guttman & Shoham, 1979).

Notes

1. With acknowledgements to P. A. Mills for assistance with this section.

References

Alonso, O. S. Raven, factor "g", edad y escorlaridad (Raven, "g" factor, age and school level). *Havana Hospital Psiquiatrico Revista*, 1973, *14*, 60-77.

Anastasi, A. *Psychological testing.* New York: MacMillan, 4th Edition, 1976.

Anderson, H. E., Kern, F. E., & Cook, C. Sex, brain damage and race effects in the Progressive Matrices with retarded populations. *Journal of Social Psychology*, 1968, *76*, 207-211.

Anderson, E., Berg, S., Lawenius, M., & Svanborg, A. Intellectual functioning in a 70-year-old urban population. *Acta Psychiatrica Scandinavica*, 1978, *57*, 59-66.

Arblaster, P. G., & Jessop, M. Intelligence as a factor affecting the diagnosis of pulmonary tuberculosis. *British Journal of Tuberculosis and Diseases of the Chest*, 1957, *51*, 358-366.

Arian, E., Delogu, E. C., Scazella, E., & Zanalda, A. Il test PM 38 (Raven) nell 'eta' avanzata (1). *Il Lavoro Neuropsichiatrico*, 1962, *30*, 2.

Baraheni, M. N. Raven's Progressive Matrices as applied to Iranian children. *Educational and Psychological Measurement*, 1974, *34*, 983-988.

Bartlett, D. P., Newbrough, J. R., & Tulkin, S. R. Raven Progressive Matrices: An item and set analysis of subjects grouped by race, sex, and social class. *Journal of Consulting and Clinical Psychology*, 1972, *38*, 154.

Berry, J. W. Ecological and cultural factors in spatial perceptual development. *Canadian Journal of Behavioral Science*, 1971, *3*, 324-336.

Brandis, W., & Henderson, D. *Social class, language and communication*, London. Routledge and Kegan Paul, 1970.

Bruni, P. Uno studio sulle possibilità del D. 48 nella Scuola Media, (A study on the application of the D48 in Secondary School). *Bolletino di Psicologia Applicata*, 1966, *77-78*, 157-169.

Bruni, R. Working percentiles based on 931 Italian children. *Personal communication*, 1954.

Byrt, E., & Gill, P. E. *Standardization of Raven's Standard Progressive Matrices and Mill Hill Vocabulary (Synonym selection) for the Irish population: Ages 6-12.* To appear. Based on thesis work at University College, Cork, 1973.

Cantwell, Z. M. The performance of American pupils on the Coloured Progressive Matrices. *British Journal of Educational Psychology*, 1967, *37*, 389-390.

Chang, Chun-Hsing. Effects of discovery approach of science instruction on elementary school children's logical thinking development. *Bulletin of Educational Psychology*, 1975, *8*, 11-24.

Chang, Chun-Hsing. Sex differences of children in school learning as related to sex differences of teachers: An analytical study of effect of availability of sex-role identification model on children's school learning. *Bulletin of Educational Psychology*, 1976, *9*, 1-20.

Chauffard-Bennassy, C. Rigidité ou plasticité des aptitudes chez l'enfant. *Enfance*, 1949, *3*, 202-221.

Conrad, R. *The deaf schoolchild: Language and cognitive function.* New York: Harper and Row, 1979.

Corman, L. & Budoff, M. Factor structures of Spanish-speaking and non-Spanish-speaking children on Raven's Progressive Matrices. *Educational and Psychological Measurement*, 1974, *34*, 977-981.

Crawford, A. An analysis of children's wrong answers on Raven's Progressive Matrices test, 1938. Proceedings: Annual Conference, B. P. S., Durham, 1955.

Das, J. P., Kirby, J. R., & Jarman, R. F. *Simultaneous and successive cognitive processes.* New York: Academic Press, 1979.

De, B., & Kala, C. Development of local norms for the Coloured Progressive Matrices. *Journal of Vocational and Educational Guidance*, 1971, *14*, 1-10.

DeFries, J. C., Johnson, R. C., Kuse, A. R., McClearn, G. E., Polovina, J., Vandenberg, S. G., & Wilson, J. R. Familial resemblance for specific cognitive abilities. *Behavior Genetics*, 1979, *9*, 23-43.

Deshpande, M. V. Sex differences on Raven's Matrices Test. *Journal of Psychological Researches*, 1971, *15*, 101-103.

Di Fiore, E., & Renda, S. Etude sur l'applicabilité de quelques tests en orientation professionelle. (Study of the applicability of several tests in vocational guidance). *Bulletin de Psychologie Scolaire et d'Orientation*, 1969, *18*, 257-271.

Eggert, D. Entwicklung einer Testbatterie für geistig behinderte Kinder. In Duhm, E. (Hrsg), *Praxis der Klinischen Psychologie*, Bd 1. Gottingen: Hogrefe, S. 55-81. 1969.

Elkin, L. Predicting performance of the mentally retarded on sheltered workshop and non-institutional jobs. *American Journal of Mental Deficiency*, 1968, *72*, 533-539.

Elley, W. B., & MacArthur, R. S. The Standard Progressive Matrices as a culture-reduced measure of general intellectual ability. *Alberta Journal of Educational Research*, 1962, *8*, 54-65.

Eysenck, H. J. Neurosis and intelligence. *Lancet*, 1943, *245*, 362-363.

Foulds, G. A. Progressive Matrices and the Mill Hill Vocabulary Scale as a diagnostic aid among psychiatric patients. *British Journal of Social and Clinical Psychology*, 1970, *9*, 80-82.

Foulds, G. A., & Dixon, P. The nature of intellectual deficit in schizophrenia Pt. I, A comparison of schizophrenics and neurotics. *British Journal of Social and Clinical Psychology*, 1962, *1*, 7-19.

Foulds, G. A., Dixon, P., McClelland, M., & McClelland, W. J. The nature of intellectual deficit in schizophrenia: Pt. 2. A cross-sectional study of paranoid, catatonic, hebephrenic and simple schizophrenics. *British Journal of Social and Clinical Psychology*, 1962, *1*, 141-149.

Freyburg, P. S. The efficacy of the Coloured Progressive Matrices as a group test with young children. *British Journal of Educational Psychology*, 1966, *36*, 171-177.

Garrity, L. I., & Donaghue, J. T. Preschool children's performance on the Raven's Coloured Progressive Matrices and the Peabody Picture Vocabulary Test. *Educational and Psychological Measurement*, 1976, *36*, 1043-1047.

Georgas, J. G. *Standardization of a Vocabulary Intelligence Test* (unpublished final progress report, research MH 12544-01) The Athenian Institute of Anthropos, 8 Demetriou Soutsou St., Athens, 602, Greece, 1970.

Georgas, J. G., & Georgas, C. A children's intelligence test for Greece. Chapter 22 in Cronbach, L. J. C. and Drenth, P. J. D., *Mental Tests and cultural adaptation.* The Hague: Mouton, 1972, pp. 217-222.

Ghuman, P. A. An exploratory study of Witkin's dimension in relation to social class, personality factors and Piagetian tests. *Social Behaviour and Personality*, 1977, *5*, 87-91.

Gill, P. Progressive Matrices in Ireland. *Proceedings of XXIst International Congress of Psychology*, Paris, 1976.

Goetzinger, M. R., & Houchins, R. R. The 1947 Coloured Raven's Progressive Matrices with deaf and hearing subjects. *American Annals of the Deaf*, 1969, *114*, 95-101.

Guttman, R. Genetic analysis of analytical spatial ability: Raven's Progressive Matrices. *Behaviour Genetics*, 1974, *4*, 273-284.

Guttman, R., & Shohan, I. Intrafamilial invariance and parent-offspring resemblance in spatial abilities. *Behaviour Genetics*, 1979, *9*, 367-378.

Harris, D. B. A note on some ability correlates of the Raven Progressive Matrices (1947) in the kindergarten. *Journal of Educational Psychology*, 1959, *50*, 228-229.

Heron, A. & Chown, S. *Age and function.* London: Churchill, 1967

Higgins, C., & Sivers, C. H. A comparison of Stanford-Binet and Coloured Raven Progressive Matrices I.Q.'s for children with low socio-economic status. *Journal of Consulting Psychology*, 1958, *22*, 465-468.

Himmelweit, H. T. Speed and accuracy of work as related to temperament. *British Journal of Psychology*, 1946, *36*, 132-144.

Jensen, A. R. The race x sex x ability interaction. In R. Cancro (Ed.), *Intelligence: Genetic and environmental influences.* New York and London: Grune and Stratton, 1971.

Johnson, E. Z. Sex differences and variability in the performance of retarded children on Raven, Binet and Arthur tests. *Journal of Clinical Psychology*, 1952, *8*, 298-301.

Kanekar, S. Academic performance in relation to anxiety and intelligence, *Journal of Social Psychology*, 1977, *101*, 153-154.

Kear-Colwell, J. J. The B factor scale of the 16 PF as a measure of intelligence in psychiatric patients. *Journal of Clinical Psychology*, 1970, *26*, 477-479.

Kennedy, R. J. *Sex differences in performance on the Raven's Progressive Matrices Test.* B. A. (Hons.) Thesis, Flinders University, S. Australia, 1972.

Kerr, A. S. Determinants of performance of the Bender Gestalt Test and Raven's Progressive Matrices (1947) test. *Journal of Learning Disabilities*, 1972, *5*, 219-221.

Kilburn, K. L., Sanderson, R. E., & Melton, K. Relations of the Raven Coloured Progressive Matrices to two measures of verbal ability in a sample of mildly retarded hospital patients. *Psychological Reports*, 1966, *19*, 731-734.

King, W. H. The development of scientific concepts in children. *British Journal of Educational Psychology*, 1963, *33*, 240-252.

Kirby, J. R., & Das, J. P. Skills underlying Coloured Progressive Matrices. *Alberta Journal of Educational Research*, 1978, *24*, 94-99.

Klauer, K. J. Der Progressive-Matrices-Test bei Volks-und-Hilfsschulkindern. *Heilpadagogische Forschung*, 1964, *1*, 13-37.

Kline, P. *Psychometrics and psychology*, London: Academic Press, 1979.

Klingelhofer, E. L. Performance of Tanzanian secondary school pupils on the Raven Standard Progressive Matrices Test. *Journal of Social Psychology*, 1967, *72*, 205-215.

Klippel, M. D. Measurement of intelligence among three New Zealand ethnic groups. *Journal of Cross-Cultural Psychology*, 1975, *6*, 365-376.

Kundu, R., & Sen, A. Matrices score with time limit and without time limit and its relationship with multiplication score. *Journal of Psychological Research*, 1964, *8*, 120-123.

Kurdek, L. A. Structural components and intellectual correlates of cognitive perspective taking in first through fourth-grade children. *Child Development*, 1977, *48*, 1503-1511.

Kuroda, J. Applications of the Coloured Progressive Matrices test for the Japanese Kindergarten children. *Psychologia*, 1959, *2*, 173-177.

Langevin, R. Is curiosity a unitary construct? *Canadian Journal of Psychology*, 1971, *25*, 360-374.

Levine, B., & Iscoe, I. A comparison of Raven's Progressive Matrices (1938) with a short form of the Wechsler-Bellevue. *Journal of Consulting Psychology*, 1954, *18*, 10.

Levine, B., & Iscoe, I. The Progressive Matrices (1938), the Chicago Non-Verbal and the Weschler-Bellevue on an adolescent deaf population. *Journal of Clinical Psychology*, 1955, *11*, 307-308.

Levinson, B. A comparative study of the verbal and performance ability of monolingual and bilingual native born Jewish preschool children of traditional parentage. *Journal of Genetic Psychology*, 1960, *97*, 93-112.

Lingwood, J. Test performances of A. T. S. recruits from certain civilian occupations. *Occupational Psychology*, 1952, *26*, 35-46.

MacArthur, R. S. *Mackenzie District Norming Project.* Ottawa: Department of Northern Affairs and National Resources, 1965.

MacArthur, R. S. Some cognitive abilities of Eskimo, White and Indian-Metis pupils aged 9 to 12 years. *Canadian Journal of Behavioural Science*, 1969, *1*, 50-59.

MacArthur, R. S. Ecology, culture and cognitive development: Canadian native youth. In L. Driedger (Ed.), *The Canadian ethnic mosaic*. Toronto: McClelland and Stewart, 1978.

MacArthur, R. S., Irvine, S. H., & Brimble, A. R. *The Northern Rhodesia Mental ability survey, 1963.* (Rhodes-Livingstone Communication No. 27) Lusaka: Rhodes-Livingstone Institute, 1964.

McLeod, H. N., & Rubin, J. Correlation between Raven Progressive Matrices and the WAIS. *Journal of Consulting Psychology*, 1962, *26*, 190-191.

Malpass, L. F., Brown, R., Hake, D. The utility of the Progressive Matrices (1956 Edition) with normal and retarded children. *Journal of Clinical Psychology*, 1960, *16*, 350.

Marjoribanks, K. Birth order, age spacing between siblings and cognitive performance. *Psychological Reports*, 1978, *42*, 114-123.

Milgram, N. A. Locus of control in Negro and White children at four age levels. *Psychological Reports*, 1971, *29*, 459-465.

Mills, P. A. Raven's Coloured Progressive Matrices: Sex differences and performance. A South Australian study and a review of other evidence. Unpublished research dissertation, Flinders University of S. Australia, 1978.

Mohan, V. Raven's Standard Progressive Matrices and a verbal test of general mental ability. *Journal of Psychological Researches*, 1972, *16*, 67-69.

Mohan, V., & Bhanot, A. Qualitative differences in the performance of introvert and extrovert children on continuous tasks. *Asian Journal of Psychology and Education*, 1976, *1*, 23-29.

Mohan, V., & Kumar, D. Qualitative analysis of the performance of introverts and extraverts on Standard Progressive Matrices. Paper read to the Indian Science Congress, Chandigarh, 1973.

Mohan, V. & Kumar, D. Qualitative analysis of the performance of introverts and extraverts on Standard Progressive Matrices. *British Journal of Psychology*, 1976, *67*, 391-397.

Mohan, V., & Kumar, D. Performance of neurotics and stables on the Standard Progressive Matrices. *Intelligence*, 1979, *3*, 355-368.

Molloy, G. N., & Das, J. P. Intellectual abilities and process: An exploratory study with implications for person-teaching method interactions. *Australian Journal of Education*, 1979, *23*, 83-92.

Montgomery, G. W. The relationship of oral skills to manual communication in profoundly deaf students. *American Annals of the Deaf*, 1966, *11*, 557-565.

Morgan, E. R. *Bilingualism and non-verbal intelligence.* Pamphlet No. 4, Faculty of Education, University College of Wales, Aberystwyth, 1957.

Muller, R. Eine kritische empirische Untersuchung des "Draw-a-man Test" und der "Coloured Progressive Matrices". *Diagnostica*, 1970, *16*, 138-147.

Myers, R., & Goldstein, D. Cognitive development in bilingual and monolingual lower-class children. *Psychology in the Schools*, 1979, *16*, 137-142.

Nathan, M., & Schnabl, A. The effect of kibbutz children's age and sex on performance in the Raven's Progressive Matrices test. *The Kibbutz*, 1976, *3-4*, 105-113.

Norman, R. D., & Midkiff, K. L. Navaho children on Raven Progressive Matrices and Goodenough Draw-a-man tests. *Southwestern Journal of Anthropology*, 1955, *11*, 129-136.

Orton, R., & Martin, D. R. Psychiatric screening of medical students. *Lancet*, 1948, *255*, 321-323.

Panek, P. E., & Stoner, S. B. Age differences on Raven's Coloured Progressive Matrices. *Perceptual and Motor Skills*, 1980, *50*, 977-978.

Petersen, L. An investigation into the applicability of the norms associated with the Standard Progressive Matrices and the Mill Hill Vocabulary Scale for modern Australian testees. Honours Thesis, University of Adelaide, 1971.

Rao, Y. R. Distribution of Progressive Matrices scores among pupils of XI standard. *Indian Journal of Applied Psychology*, 1975, *12*, 76-82.

Rao, S. N., & Reddy, I. K. S. Development of norms for Raven's Coloured Progressive Matrices test (booklet form) on elementary school children. *Psychological Studies*, 1968, *13*, 105-107.

Raven J. The 1979 standardization of the Standard Progressive Matrices and Mill Hill Vocabulary Scales. Research Supplement No. 1 to the Manual for *Raven's Progressive Matrices and Vocabulary Scales*. London: H. K. Lewis, 1981.

Raven, J. C. The R. E. C. I. series of perceptual tests: An experimental survey. *British Journal of Medical Psychology*, 1939, *18*, 16-34.

Raven, J. C. Raven's Intelligence Test. *British Medical Journal*, 1947, *4510*, 872.

Raven, J. C. The comparative assessment of intellectual ability. *British Journal of Psychology*, 1948, *39*, 12-19.

Raven, J. C. *The Advanced Progressive Matrices*. London: H. K. Lewis, 1963.

Raven, J. C., Court, J. H., & Raven J. *Manual for Raven's Progressive Matrices and Vocabulary Scales*. London: H. K. Lewis, 1977.

Rawlinson, B. A cross-cultural study of intelligence in Papua New Guinea and Tasmania. *New Guinea Psychologist*, 1974, Monograph Supplement 6, 46.

Rich, C., & Anderson, R. P. A tactual form of the Progressive Matrices for use with blind children. *Personnel and Guidance Journal*, 1965, *43*, 912-919.

Richardson, H. J. *Adolescent girls in approved schools*. London: Routledge and Kegan Paul, 1969.

Rimoldi, H. J. A. Ensayo de tipificacion de una prueba mental. (Progressive Matrices de Raven) *Publicaciones del Instituto de Psicologia Experimental* (Universidad Nacional de Cuyo), 1945, *1*, 85-114.

Rimoldi, H. J. A. Tipificacion de los Progressive Matrices de Raven. *Publicaciones del Instituto de Psicologia Experimental*, 1947, *2*, 1.

Rohwer, W. D., Ammon, M. S., Suzuki, N., & Levin, J. R. Population differences and learning proficiency. *Journal of Educational Psychology*, 1971, *62*, 1-14.

Schmidtke, A., Schaller, S., & Becker, P. Manual: *Raven-Matrizen-Test. Coloured Progressive Matrices*. Beltz Test: Gesellschaft Weinheim, 1978.

Semler, I. J., & Iscoe, I. Structure of intelligence in negro and white children. *Journal of Educational Psychology*, 1966, *57*, 326-336.

Sigel, I. E. How intelligence tests limit understanding of intelligence. *Merrill-Palmer Quarterly*, 1963, *9*, 39-56.

Simon, A., & Ward, L. O. Age, sex, intelligence and religious beliefs in 11 to 15 year old pupils. *Irish Journal of Education*, 1975. *9*, 108-114.

Sinha, U. The use of Raven's Progressive Matrices test in India. *Indian Educational Review*, 1968, *3*, 75-88.

Sinha, M., & Chandrakala. Correlations between Harris' and Burt's Draw-a-man scales and some other measure of intelligence. *Journal of Psychological Researches*, 1972, *16*, 116-120.

Sitkei, E. G., & Michael, W. B. Predictive relationships between items on the Revised Stanford-Binet Intelligence Scale (SBIS), Form L-M, and total scores on Raven's Progressive Matrices (PM), between items on the PM and total scores on the SBIS, and between selected items on the two scales. *Educational and Psychological Measurement*, 1966, *26*, 501-506.

Spearman, C. *The nature of intelligence and the principles of cognition.* London: MacMillan and Co., 1923.

Sperrazzo, G., & Wilkins, W. L. Further normative data on the Progressive Matrices. *Journal of Consulting Psychology*, 1958, *22*, 35-37.

Sperrazzo, G., & Wilkins, W. L. Racial differences on Progressive Matrices. *Journal of Consulting Psychology*, 1959, *23*, 273-274.

Stachyra, J. The mental development of deaf children. *Roczniki Filozoficzne*, 1971, *19*, 101-114.

Surrey Educational Research Association. Analysis of Raven's Matrices scores. Preliminary report, (unpublished), 1978.

Sweet, R. *Some recent adolescent and adult norms for the PM 38.* Research Report: Division of student services, Sydney Technical College. Mimeo, 5 pp. 1976.

Sydiaha, D. Prediction of WAIS I.Q. for psychiatric patients using the Ammons' FRPV and Raven's Progressive Matrices. *Psychological Reports*, 1967, *20*, 823-826.

Szegedi, M. A Raven-fele intelligencia teszt ervenyessegenek statisztikai vizsgalata a hazai szuroproba tukreben. *Magyar Pszichologiai Szemle*, 1974, *31*, 194-201.

Tesi, G., & Young, H. B. A standardization of Raven's Progressive Matrices 1938 (revised 1956). *Archivio di Psicologia Neurologia e Psichiatra*, 1962, *5*, 455-464.

Tuddenham, R. D., Davis, L., Davison, L., & Schindler, R. An experimental group version for school children of the Progressive Matrices. Abstract: *Journal of Consulting Psychology*, 1958, *22*, 30.

Tulkin, S. R., & Newbrough, J. R. Social class, race and sex differences on the Raven (1956) Standard Progressive Matrices. *Journal of Consulting and Clinical Psychology*, 1968, *32*, 400-406.

Turner, G. H., Hall, V.C., & Grimmet, S. Effects of familiarization feedback on the performance of lower-class and middle-class kindergarteners on the Raven's Coloured Progressive Matrices. *Journal of Educational Psychology*, 1973, *65*, 356-363.

Valentine, M. Psychometric testing in Iran. *Journal of Mental Science*, 1959, *105*, 93-107.

Valseschini, S., & Delton, F. *Le Matrici Progressive di Raven.* Universiti di Milano, Edizioni Firenze, 1973.

Van Dam, F. Le "Advanced Progressive Matrices I and II" de J. C. Raven an niveau des premières candidatures en sciences. *Revue Belge de Psychologie et de Pêdagogie*, 1976, *38*, 1-12.

Vandenberg, S.G., & Price, R. A. Replication of the factor structure of the Comrey Personality Scales. *Psychological Reports*, 1978, *42*, 343-352.

Vejleskov, H. An analysis of Raven Matrix responses in fifth grade children. *Scandinavian Journal of Psychology*, 1968, *9*, 177-186.

Wetherick, N. E. Structure and content in concept attainment: Effects of varying problem content. *British Journal of Psychology*, 1967, *58*, 223-226.

Wiltshire, E. B., & Gray, J. E. Draw-a-man and Raven's Progressive Matrices (1938) Intelligence Test performance of reserve Indian children. *Canadian Journal of Behavioural Sciences*, 1969, *1*, 119-122.

Winkelmann, W. Normen für den Mann-Zeichen-Test von Ziler und die Coloured Progressive Matrices von Raven für 5-7 jährige kinder. *Psychologische Beiträge*, 1972, *14*, 80-93.

Wittenberg, J. J. Die Progressive Matrices 1947. In Wellek, A. (Hrsg). *Berischt über Den 21. Kongress der Deutschen Gesellschaft für Psychologie.* Göttingen: Hogrefe, S. 1958, 255-258.

Young, H. B., Tagiuri, R., Tesi, G., & Montemagni, G. Influence of town and country upon children's intelligence. *British Journal of Educational Psychology*, 1962, *32*, 151-158.

Ziv, A. Sex differences in performance as a function of praise and blame. *Journal of Genetic Psychology*, 1972, *120*, 111-119.

The Alberta Journal of Educational Research *Vol. XXIX, No. 1, March, 1983, 75-84*

The History and Development of CAI: 1926-1981, An Overview

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Computer aided instruction (CAI) is increasingly being used in the classroom in the 1980's. From preschool to post-graduate education the computer has found a growing niche in the classroom. Déja vu? Perhaps, because CAI has been in the classroom before. That those who are not aware of its past are bound to repeat it has been woefully noted by educators. The purpose of this paper is to present an overview of the history of CAI so that those educators who are using CAI may be more aware of where it has been and may be better able to guide the development and application of CAI in the future.

Early Teaching Machines

The history of computer aided instruction is inextricably mixed with and related to the histories of both education and computers. Because of this and the fact that these two histories developed independently and at different rates, the history of CAI does not easily lend itself to a straightforward didactic discourse. However, a brief chronological overview, which focuses upon significant individuals and programs in this area, will be presented.

This overview begins in the mid 1920's with Pressey. As suggested by the title of his first article "A Simple Apparatus Which Gives Tests and Scores — and Teaches" (Pressey, 1926), Pressey was interested in designing mechanical devices which could automatically provide drill and practice items to students in order to:

> Lift from her [the teacher's] shoulders as much as possible of this burden [drill and "information-fixing"] and make her freer for those inspirational and thought-stimulating activities which are, presumably, the real function of the teacher. (p. 373)

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Pressey did not only have an interest in saving time for the teacher, but was also keenly interested in delivering "individualized" instruction as can be noted in the instructional paradigm he "programmed" into his machine:

> An apparatus for teaching drill material which (a) should keep each question or problem before the learner until he finds the correct answer, (b) should inform him at once regarding the correctness of each response he makes, (c) should continue to put the subject through the series of questions until the entire lesson has been learned, but (d) should eliminate each question from consideration as the correct answer for it has been mastered (Pressey, 1927, p. 552).

It should be noted that some may object to even including Pressey's teaching machines in the history of CAI because these machines were mechanical in nature and computers, by definition, are electronic. However, the early contribution Pressey made by integrating the notions of machines and learning, as well as his introduction of a mastery learning paradigm into his "teaching machines," are the major reasons for beginning the overview of the history of CAI with Pressey.

Many individuals experimented with several types of teaching machines over the next two decades, but it was not until the 1950's that the next significant contribution to the history of CAI occurred. Skinner's experimental work in the area of stimulus-response and reinforcement was the next major development which further contributed to an understanding of the usefulness and the application of teaching machines. In a paper presented at a psychology conference in 1954, Skinner noted that the relationship and importance of reinforcement to learning had been well documented, yet the classroom environment was relatively devoid of its use. He further noted that the teacher, because of class sizes and the styles of teaching and grading being used, was not likely to succeed in properly implementing increased reinforcement (Skinner, 1954). Skinner then stated that:

> If the teacher is to take advantage of recent advances in the study of learning, she must have the help of mechanical devices.
>
> The technical problem of providing the necessary instrumental aid is not particularly difficult. There are many ways in which the necessary contingencies may be arranged, either mechanically or electrically. An inexpensive device which solves most of the principal problems has already been constructed. . . . The important features of the device are these: Reinforcement for the right answer is immediate. The mere manipulation of the device will probably be reinforcing enough to keep the average pupil at work for a suitable period each day, provided traces of earlier aversive control can be wiped out. A teacher may supervise an entire class at work on such devices at the same time, yet each child may progress at his own rate, completing as many problems as possible within the class period. If forced to be away from school, he may return to pick up where he left off. The gifted child will advance rapidly, but can be kept from getting too far ahead either by being excused from arithmetic for a time or by being given special sets of problems which take him into some of the interesting bypaths of mathematics.
>
> The device makes it possible to present carefully designed material in which one problem can depend upon the answer to the preceding and where, therefore, the most progress to an eventually complex repertoire can be made. (Skinner, 1954, p. 95)

In conclusion, Skinner advocated that mechanized instruction should be integrated into all schools, not as a replacement for, but as an adjunct to the teacher.

Research in the "Teaching Machine Project" at the IBM research center during the late 1950's led to the development and application of an IBM 650, a high-speed digital computer, as a teaching machine. A typewriter was interfaced to the IBM 650 and this configuration was known as the "IBM 650 Inquiry Station."

> The IBM 650 Inquiry Station is a typewriter and a console which is capable of transmitting typed information to the computer and receiving information from the computer. The student sits at the Inquiry Station. The program of instructions in the computer presents the problem to the student by way of the typewriter. The student, in turn, types his answer, which is transmitted to the computer for checking. (Rath, Anderson & Brainerd, 1959, p. 126)

The subject matter taught by this early CAI system was binary arithmetic. It should be noted that this system required "running one *S* [student] in real time with the computer," however, the authors noted that the computer spent most of its time waiting for the student to respond and could probably be multiplexed in order to "present and score problems for several students who sat at different inquiry stations" (Rath et al., 1959, p. 129).

Needless to say, other educational technologies had also been invented and developed during the twenties, thirties, fourties, and fifties. In addition, diverse and physically different types of "teaching machines" had been developed, but as different from one another as they may have appeared physically, the teaching machines maintained several unifying and identifying characteristics.

In the review, "Teaching Machines and Self-Instructional Materials," Lumsdaine (1959) identified three major properties which distinguished the teaching machines from films, television, and other audiovisual media:

> First, continuous active student response is required, providing explicit practice and testing of each step of what is to be learned.
>
> Second, a basis is provided for informing the student with minimal delay whether each response he makes is correct, leading him directly or indirectly to correction of his errors.
>
> Third, the student proceeds on an individual basis at his own rate — faster students romping through an instructional sequence very rapidly, slower students being tutored as slowly as necessary, with indefinite patience to meet their special needs. (p. 164)

Thus by the beginning of the 1960's, the knowledge, understanding, and potential application of CAI had been fairly well identified and subjected to preliminary testing by both engineers and psychologists. However, in spite of the progress made by engineers and psychologists in designing teaching machines and analyzing their effect on learning, Pressey's "hope" and Skinner's "encouragement" were not generally heeded by educators, and by 1960 "teaching machines" still had not found a niche in the classroom.

Dick (1965) noted that "computer instruction offers an almost unlimited area of research into individual differences" (p. 44). He further, perhaps optimistically, stated that "Skinner has said that cultural inertia blocked the use of Pressey's teaching machines in the twenties. Our culture is apparently ready for Skinner's machines in the sixties" (p. 53).

Dedicated CAI Systems in the 1960's

CAI was attempted in a variety of subject matter on virtually every type of computer in use in the 1950's and 1960's (for example: Licklider, 1962; Morrison & Adams, 1968; Schurdak, 1967; Stolurow, 1967). However, two major systems in particular, the IBM 1500 and PLATO, were developed specifically for CAI in the early 1960's and contributed significantly to its use.

Early collaborative work between the Institute for Mathematical Studies in the Social Sciences (IMSSS) at Stanford University, under the direction of Richard Atkinson and Patrick Suppes, and the International Business Machine (IBM) Corporation led to the development of the IBM-1500 Instructional System. The system consisted of: a central process computer; a disc storage unit; a magnetic tape unit; a card read-punch unit; a printer; an audio control unit; two proctor stations; and sixteen student stations. Each student station consisted of: a cathode ray tube display screen; a picture projector with rear image screen; a modified typewriter keyboard with certain added function keys; a light pen; and an audio system. The proctor stations were similar to the student stations except that they did not contain the audio or film projector units (Atkinson, 1968).

Initially, the IBM 1500 Instructional System was used to teach reading (Atkinson & Hansen, 1966) and mathematics (Suppes, 1966) to primary school students. Other programs and courses, however, rapidly developed including college and university level courses, i.e. Russian (Suppes & Morningstar, 1969).

At about the same time that the IBM 1500 Instructional System was being developed another cooperative research group was at work on a different CAI system. This group, consisting of members from the University of Illinois, under the direction of Donald Bitzer, the Control Data Corporation (CDC), and the National Science Foundation, began work in the early 1960's on the PLATO System.

PLATO (Programmed Logic for Automatic Teaching Operations) was developed to deliver CAI via a large mainframe or macro-computer system as opposed to a mini-computer (i.e. the IBM 1500). By utilizing this larger computer system it was possible to have a much larger library of programs immediately available for student use; to utilize more easily sophisticated programs to automatically keep track of an individual student's progress in a series of CAI programs; and to provide access to many times more students than was possible with a mini-computer system (i.e. a ten- to fifty-fold increase in the potential number of simultaneous users).

The early PLATO II System ran on the ILLIAC I computer at the University of Illinois. This system had a "high speed electrostatic memory of 1024 40-bit words and an auxiliary magnetic drum storage of 10,240 words" (Bitzer, Braunfel & Lichtenberger, 1962, p. 206). Students communicated with the system by means of a keyboard which contained alphanumeric characters and a special set of function keys (i.e. continue, help, aha). Feedback and new material or questions were presented to each student via closed circuit television. Slides and alphanumeric characters could be simultaneously superimposed on the students' screen. A major feature of this system was that it could instruct a number of students concurrently, while the PLATO I originally had only one student terminal connected to it.

The next PLATO System, also developed in the 1960's, consisted of a large CDC 1604 mainframe computer and a number of remote student terminal

stations. Each station consisted of: a plasma terminal display screen capable of detecting areas which were touched (as in pointing to an answer on the screen); a modified typewriter keyboard with certain added function keys; and a computer-controlled electronic slide selector. Other peripheral devices (i.e. film projectors, audio units) could be interfaced to the student terminal station and placed under computer control if necessary. An added feature of the system was the ability to have communication between the various terminals transmitted via the central computer.

Despite the advances made by the IBM 1500 Instructional System and PLATO, as well as numerous other individual achievements and developments in the area of CAI, the role of the computer in education, contrary to Dick's (1965) prediction, was minimal in the 1960's. Were then the 1970's to become the "Age of CAI"? Certainly many leading authorities in the field of CAI (Bitzer & Bitzer, 1973; Suppes, 1966) thought so: "Within the next decade teachers and computers will become educational partners" (Hicks & Hunka, 1972, p. 20).

Application of Microcomputers in the 1970's

The major developments during the 1970's which bode well for CAI were the development of the TICCIT System and educationally oriented microcomputers.

During the early 1970's another co-operative research effort between a University based group and a private corporation yielded a significant contribution to the field of CAI. The groups involved were a group from Brigham Young University, under the direction of Victor Bunderson, and a group from the MITRE Corporation. The result of this co-operative effort was the Time-shared, Interactive, Computer-Controlled, Information Television (TICCIT) System of CAI (Suppes & Macken, 1978).

TICCIT was originally a 32 terminal minicomputer based CAI system which used the television as the display device by which it delivered CAI programs to student users. The original subject matter consisted of English and mathematics programs intended for students at the junior or community college level (Suppes & Macken, 1978).

A major contribution made by the TICCIT System to CAI was not in the hardware or courseware which it used per se, but in its application of a theory for instruction as its base. The hardware as well as the courseware which ran on the system, was based on a theory for instruction developed by M. David Merrill (Merrill, 1980; Reigeluth, 1979). This theory for instruction was primarily concerned with strategies for teaching a single concept or principle. According to this theory:

> Any particular instance of a complex cognitive instructional presentation must always feature some combination of presentation mode and content. The qualitative values are expository (E), inquisitory (I), generality (G), and instance (eg). Combining them into a two-way table will produce the following presentations: expository generality (EG), expository instance (Eeg), inquisitory generality (IG), and inquisitory instance (Ieg). In an expository-generality (EG) presentation, S [student] is presented definitions or rules and directed to study or read these generalities. In an expository-instance (Eeg) presentation, S is presented exemplars or nonexemplars of a given concept along with some indication of appropriate class membership or a sample of the application of a rule to a particular problem. This presentation may be in the form of questions, if the answer is given at the same time. In an inquisitory-generality

> (IG) presentation, the student is asked to reproduce or deduce the definition or rule. . . . In an inquisitory-instance (Ieg) presentation, S is presented an exemplar or nonexemplar of a concept and asked to indicate class membership, or he is given a problem and asked to apply the rule. (Merrill & Boutwell, 1973, pp. 106-107)

TICCIT applied this theory to an instructional paradigm with the assumption that "a given idea concept, procedure, or principle — should be presented in each of three modes: rule, example, and practice" (Merrill, 1980, p. 77).

This was the first time, since the application of Pressey's simple mastery paradigm and Skinner's immediate reinforcement to the early teaching machines, that CAI formally and rigorously attempted to base its operations in instructional theory. TICCIT thus became the first CAI system to be extensively based in instructional theory (Reigeluth, 1979).

The other major CAI development during the 1970's was the development of microcomputers. Microcomputers are basically a scaled down or unit version of large computers. They are relatively small and possess stand alone computer facilities with a minimum amount of hardware. Basically this includes a microprocessor with a display screen and a keyboard for data entry.

Micro-electronic and silicon chip technology, developed in the early 1970's, resulted in the development of microprocessors, which possessed the power of the older and physically several hundred-fold larger computer processors, but at a cost several hundred-fold less (Vacroux, 1975; Wagner, 1976). This opened the door for the development of microcomputers and by 1975 the first commercially available microcomputers, the Altair 8800, the Intellec-8, and the Motorola Microcomputer, were released in kit form ready for the consumer to assemble. Others (i.e. Heathkit, SOL) rapidly became available at lower and lower costs. However, because of the expertise and time necessary to properly assemble one of these units few educators took advantage of them to deliver CAI, although use was made of these kits in vocational education, electronics, and computer science courses.

This changed in 1977 with the appearance of the PET 2001 microcomputer by Commodore. This was a fully assembled and tested microcomputer which could appeal to the general consumer or educator without the necessity of computer or electronics knowledge. Others which appeared at about the same time in ready to run form included: Apple, Compucolor, Datapoint, Exidy Sorcerer, IMSAI, SOL (by Processor Technology), and TRS-80 (by Radio Shack).

The microcomputer did much to promote CAI, both directly and indirectly. Because of the microcomputer's attractive features (i.e. portability, self-containment, low cost), it produced a wider interest in the use of CAI among educators than had any of the previous types of CAI delivery systems. Thus, many schools had their first, and perhaps only, contact with CAI because of and by means of the microcomputer.

Indirectly, the microcomputers contributed to CAI both within and outside the educational community by making CAI technology available at an affordable price to lay individuals and educators alike. This in turn resulted in the desire of interested individuals to learn more about microcomputers and their potential applications, including CAI, and a need for vehicles by which this information could be communicated.

In response to this need, numerous publications, clubs, and organizations devoted primarily to microcomputers and/or CAI were developed in the 1970's. The journals included titles such as: *Byte*, *Dr. Dobb's Journal*, *Interface Age*, *Kilobaud Microcomputing*, and *Personal Computing*. The clubs, primarily lay or hobbyist oriented, produced newsletters and publications and sponsored "personal computer conferences" and "computer fairs." Many professional organizations which were started or expanded during the 1970's (i.e. Association for the Development of Computer-Based Instruction Systems [ADCIS], Association for Educational Data Systems [AEDS]) owe a great deal to the interest in CAI generated by the development of microcomputers.

A further, perhaps larger and more important, "ripple" effect which the microcomputers have had on CAI was that of increasing public awareness of computers in general. This ultimately will probably be the most significant contribution which the microcomputers will have in promoting CAI, that is: to decrease the "societal inertia" which had hitherto hindered the growth of CAI.

Despite these advances CAI continued to be the exception, rather than the rule, in the classroom during the 1970's. This situation certainly was not expected, as witnessed by earlier predictions, nor can it be easily explained. The technology and instructional psychology of CAI had developed sufficiently to warrant its widespread use and societal (especially student user) inertia seemed to be minimal. Educational funding cutbacks during the 1970's certainly may have contributed to the situation. A tempting speculation is that educators themselves were primarily responsible for this situation (Norris, 1978).

Current Status

What of the 1980's? It is still too early to predict whether or not this decade will see CAI become widely and routinely integrated into the instructional system. The first two years have seen both advances and retreats for CAI.

The current state of affairs for CAI in the 1980's will begin with a review of the progress and status of two major dedicated CAI systems, the IBM 1500 Instructional System and PLATO.

The IBM 1500 Instructional Systems were extensively used and tested by educators and researchers from the mid-1960's through the 1970's. Major centers of application and development included Stanford University, Florida State University, Pennsylvania State University, and the University of Alberta. Despite the 1500's ability to deliver highly sophisticated CAI, the IBM Corporation discontinued support for the system and the last one was removed from service at the University of Alberta in 1980. This system was not replaced by IBM with another dedicated CAI system.

The PLATO system, on the other hand, has continued to develop since its inception in the early 1960's. Since that time it has shown steady increases in the quality and variety of CAI courses available on it. The 1981 catalog of published PLATO courses contained over seven hundred entries in disciplines ranging from astronomy to veterinary science. In addition, many times this number of programs exist in an unpublished form, available on a restricted basis at the various universities and centers which utilize the PLATO system.

Various central computers have been utilized by the PLATO system including the CDC 1604, the CDC 6400, the CDC CYBER 74, the CDC CYBER 170, and the CDC CYBER 172. PLATO hardware and software changes, now entering their

fifth generation, have enabled the system to keep pace with growing numbers of student users so that from an early capacity of 20 simultaneous student users, the maximum system configuration is now capable of supporting over six hundred terminals simultaneously at an acceptable performance level, and can theoretically support over one thousand simultaneous users. Major centers which now have PLATO computer or terminal facilities include: the Universities of Alberta, Arizona, Belgium, Colorado, Delaware, Finland, Florida State, Illinois, Minnesota, Quebec, and Western Cape (South Africa); learning centers in over one hundred cities throughout North America; and several North American secondary school districts. In total, 15 central computers and over two thousand terminals are currently dedicated to PLATO use. A microcomputer version of PLATO has been developed and is currently being tested.

Microcomputers are by far the most widely used "systems" for CAI. Some, such as the SOL, have not survived into the 1980's. However, most of the major original microcomputers have survived into the 1980's and are now into their second or third generation of machine modifications.

Microcomputers have continued to decrease in cost while features, such as increasing memory space, have been improved. Peripherals and microelectronic boards are now available for most microcomputer systems which permit data storage and retrieval on floppy disks; use of several computer and authoring languages; interfacing with a printer; sound recognition and synthesis; use of color; generation of dynamic (animated) graphics; and the ability to create special characters.

This discussion of microcomputers and CAI would be incomplete and perhaps misleading, however, if mention at least were not made of microcomputers' significant limitations. The application and use of microcomputers in CAI currently has three major limitations: 1) lack of high quality, manufacturer produced courseware; 2) general inability to readily transfer material from one system to another; and 3) general inability to centrally collect and record individual student and class responses automatically for data analysis. These limitations have not been sufficiently addressed by educators.

> There is a real danger that microcomputers will be purchased by schools and shortly, relegated to a cupboard for most of the time. The danger is especially acute where CAI is concerned: unless sufficient high quality programs are available, there is no possibility that a microcomputer can be used sufficiently to justify its cost. (Hallworth & Brebner, 1980, p. 115)

Perhaps the question for the 1980's is not whether CAI will be used, but whether it will be used wisely. As Braun (1980) has noted: "Computers will move into our homes and our schools whether or not anyone does anything to ensure their effective use" (p. 110). [2]

I would like to thank Stephen M. Hunka and Ann M. Pagliaro for their assistance and suggestions in the preparation of this paper.

References

Atkinson, R. C. Computerized instruction and the learning process. *American Psychologist*, 1968, *23*, 225-239.

Atkinson , R. C., & Hansen, D. N. Computer-assisted instruction in initial reading: The Stanford project. *Reading Research Quarterly*, 1966, *2*, 5-25.

Bitzer, D. L., Braunfel, P. G., & Lichtenberger, W. W. PLATO II: A multiple-student, computer-controlled, automatic teaching device. In J. E. Coulson (Ed.), *Programmed learning and computer-based instruction.* New York: John Wiley & Sons, 1962.

Bitzer, M. D., & Bitzer, D. L. Teaching nursing by computer: An evaluative study. *Computers in Biology and Medicine*, 1973, *3*, 187-204.

Braun, L. Computers in learning environments: An imperative for the 1980's. *Byte*, 1980, *5*, 105-114.

Dick, W. The development and current status of computer-based instruction. *American Educational Research Journal*, 1965, *2*, 41-54.

Hallworth, H. J., & Brebner, A. Computer assisted instruction in schools: Achievements, present developments and projections for the future. A Report Presented to Alberta Education, June 1980.

Hicks, B. L., & Hunka, S. M. *The teacher and the computer.* Philadelphia: W. B. Saunders, 1972.

Licklider, J. C. Preliminary experiments in computer-aided teaching. In J. E. Coulson (Ed.), *Programmed learning and computer based instruction.* New York: John Wiley & Sons, 1962.

Lumsdaine, A. A. Teaching machines and self-instructional materials. *Audio-Visual Communication Review*, 1959, *7*, 163-181.

Merrill, M. D. Learner control in computer based learning. *Computers and Education*, 1980, *4*, 77-95.

Merrill, M. D., & Boutwell, R. C. Instructional development: Methodology and research. In F. Kerlinger (Ed.), *Review of Research in Education* (Vol. 1). Washington: AERA, 1973.

Morrison, H. W., & Adams, E. N. Pilot study of a CAI laboratory in German. *Modern Language Journal*, 1968, *52*, 279-287.

Norris, W. C. Computer technology, education and the bottom line. *AEDS Monitor*, 1978.

Pressey, S. L. A simple apparatus which gives tests and scores — and teaches. *School and Society*, 1926, *23*, 373-376.

Pressey, S. L. A machine for automatic teaching of drill material. *School and Society*, 1927, *25*, 549-552.

Pressey, S. L. A third and fourth contribution toward the coming "industrial revolution" in education. *School and Society*, 1932, *36*, 668-672.

Rath, G. J., Anderson, N. S., & Brainerd, R. C. The IBM research center teaching machine project. In E. H. Galanter (Ed.), *Automatic teaching: The state of the art.* New York: John Wiley & Sons, 1959.

Reigeluth, C. M. TICCIT to the future: Advances in instructional design theory for CAI. *Journal of Computer-Based Instruction*, 1979, *6*, 40-46.

Schurdak, J. J. An approach to the use of computers in the instructional process and an evaluation. *American Educational Research Journal*, 1967, *4*, 59-73.

Skinner, B. F. The science of learning and the art of teaching. *Harvard Educational Review*, 1954, *24*, 86-97.

Skinner, B. F. Teaching machines. *Science*, 1958, *128*, 969-977.

Stolurow, L. M. Computer-based instruction: Psychological aspects and systems conception of instruction. *Journal of Educational Data Processing*, 1967, *4*, 193-215.

Suppes, P. The use of computers in education. *Scientific American*, 1966, *215*, 207-220.

Suppes, P., & Macken, E. The historical path from research and development to operational use of CAI. *Educational Technology*, 1978, *18*, 9-12.

Suppes, P., & Morningstar, M. Computer-assisted instruction. *Science*, 1969, *166*, 343-350.

Vacroux, A. G. Microcomputers. *Scientific American*, 1975, *232*, 32-40.

Wagner, F. V. Is decentralization inevitable? *Datamation*, 1976, *22*, 86-97.

The Alberta Journal of Educational Research *Vol. XXIX, No. 1, March, 1983, 85-87*

BOOK REVIEW

ED. PSYCH.: A CANADIAN PERSPECTIVE. *By Alan Bowd, Daniel McDougall and Carolyn Yewchuk.* Toronto: Gage Publishing, 1982, 470 pp.

This undergraduate textbook of educational psychology elicits a variety of emotional reactions - hope, disappointment, excitement, frustration and confusion. These feelings emerge and recede as the authors' unique contributions to the field are subverted by a fluctuating view of educational psychology. A shifting conceptualization from the traditional to the integrative, occurs as one progresses through the text. This lack of a consistent approach and the failure to present a truly Canadian perspective are not counterbalanced by a much needed and long overdue treatment of Bilingualism and Native education.

The title of the book offers a sense of hope that a Canadian perspective on educational psychology will be forthcoming. A number of educational psychologists have noted the difficulty of defining their discipline in terms of a unique perspective. That makes the attempt of Bowd, McDougall and Yewchuk to define a Canadian perspective a particularly ambitious undertaking. The excitement arising from anticipation of such a definition, however, is quickly diminished when one realizes that the objective of the text is to provide an "overview of psychology as it applies to basic concerns and issues in Canadian education in the 1980s" (p.10). This objective is attained by focusing on research conducted in Canada and making numerous references to Canadian scholars. Nevertheless, unlike ethnic and cultural studies, the research presented is not peculiar to Canada and hence, a new perspective to educational psychology is not to be unveiled.

The authors' ever-changing view of educational psychology is another major limitation of the text and for the most part leads to confusion. Initially, it is stated, "that psychology becomes *educational psychology* when its principles are applied to problems in education" (p.6). This traditionalist position is most apparent in the Development and Learning section (Part I) where education and psychology are seen as separate entities by the authors. A brief and cursory overview of learning theories, language development and motivation is presented. Educational implications arising from the theories of Piaget, Skinner and others are attached as seemingly mere appendages at the end of each chapter. The traditional position is maintained for the first 120 pages of the text; however, proponents of this approach are soon to be disappointed.

The integrative approach to educational psychology begins to appear in Part II: Socialization and Discipline. In their approach to this section the authors may have been influenced by the widely cited Scandura (1978) paper in which it was concluded that, in order for educational psychology to become a recognized discipline, "it must divorce itself from being just psychology applied to education" (p. 43). The section on Growing Up in Canada relates the family, school, and

other institutions to the socialization process. The integration of psychology and education is perhaps most fully developed in the chapter on Discipline. A synthesis of the theoretical framework, techniques, skills and examples of classroom management should prove useful to all educators, with special importance to beginning teachers.

Perhaps the most significant contribution of the text, and that which distinguishes it from others in the field, is its emphasis upon and treatment of the Needs of Special Groups of Children (Part III). This section closely approximates the renaissance approach to educational psychology advocated by Shapiro (1982), particularly in the chapters on Bilingualism and Native Education. For each topic the reader is provided with an historical and sociological context of the problems ethnic and Native students are faced with today. A multitude of strategies for effectively dealing with the "special child" in the classroom are related to the characteristics of cultural and linguistical differences of individuals and groups. In addition, a comprehensive overview of the nature of the Exceptional Child, as traditionally defined, is included. The studies, research, and examples presented in all three sections are relevant, pertinent, and related to education in the Canadian setting. This section should be an integral component of all teacher education programs in Canada.

The renaissance view of educational psychology which glimmered in Part II, and glowed in Part III, is gradually extinguished in Part IV. The reader experiences feelings of frustration as the traditional position reappears. The assessment of cognitive, affective, and psychomotor abilities is the focus of the Measurement and Evaluation section. Fundamental concepts such as test development, measurement, and taxonomies become the basis for discussions of educational issues related to teacher-observation, sociometry, and the evaluation of student performance. These chapters are of vital significance to the teacher, but the roller-coaster ride through the text, a function of the changing conceptualizations of educational psychology, detracts from the content.

Another limitation of the text is its failure to deal with the role of the teacher, or of educational psychology, in the future. The influence of a rapidly changing socio-politico-economic framework in the 1980s and 1990s will affect human behaviour, educational theory, and, therefore, the teacher. It could be argued that providing the reader with a consciousness of the future, of impending educational dilemmas, coping strategies and anticipated behavioural roles, is a responsibility that a text of this kind can no longer afford to ignore.

More positively, the text has some interesting features with respect to structure, style, and format. For instance, highlight sections, marginal summaries, directives for discussion, key terms, and concepts are included in each chapter. The use of Canadian research and writing provides an interesting dimension to otherwise familiar material. The authors write in an informal and easy-to-read style which should be attractive to most undergraduate students in Education.

In summary, the lack of conceptual consistency is a major weakness of the text. Moreover, the choice of a somewhat presumptuous title creates false expectations, leaving the reader with a sense of disappointment. Although the role of teacher in the future is noticeably absent, the text does make a significant contribution by virtue of its treatment of Bilingualism and Native Education. Unfortunately, in the final analysis the strengths of the text do not offset the weaknesses.

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Scandura, J. M. Current status and future directions of educational psychology as a discipline. *Educational Psychologist*, 1978, *13*, 43-56.

Shapiro, B. J. The Renaissance educational psychologist. Paper presented at the Canadian Society for the Study of Education conference, Ottawa, June, 1982.

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The ACEHI Journal, for the Association of Canadian Educators of the Hearing Impaired, is devoted to professional articles in the area of deafness. This quarterly journal concerns itself primarily with educational studies, together with articles of a general nature. The subscription is $20 per year, and communications should be addressed to the Editor, Department of Educational Psychology, 6-102 Education North.

The Alberta Journal of Educational Research

Alberta Journal of Educational Research has served the interests of educational research in Canada and abroad since its inception in 1955. In its commitment to the dissemination, criticism, interpretation and encouragement of all forms of systematic inquiry into education, the journal has acted as a vital force in the publication of research results of established scholars in psychology, administration, curriculum, sociology, history, and philosophy.

AJER is published in March, June, September and December; the subscription is $12 per year. All back issues are available; rates will be supplied upon request. *AJER* is indexed in, among others, the Canadian Educational Index. Address communications to the Editor, *AJER*, 845 Education South.

The Canadian Administrator

The Canadian Administrator serves administrators at all levels of educational organizations. Articles selected for publication are intended to familiarize practitioners with the findings and implications of research, and with analyses of current policies and practices. Published eight times per year October through May; subscription is $6 per year. Address communications to the Editor, *The Canadian Administrator*, Department of Educational Administration, 7-104 Education North.

Canadian Journal of Native Education

Canadian Journal of Native Education publishes articles, presents abstracts of research, book reviews and reports news items related to the education of native peoples. Two other items featured in *CJNE* are Teacher's Forum which consists of letters and articles from teachers and students concerning issues in their schools or in native education generally, and the Bibliography for Teachers which provides annotated lists of resources and materials (books, films and kits) for and about Native people for use in schools.

Published four times per year; subscription of $5 per year. Address communications to the Editor, *Canadian Journal of Native Education*, Department of Educational Foundations, 5-109 Education North.

Elements

Elements endeavours to help educators translate theory and findings from current research into classroom practice. Each issue focuses on a specific subject area, topic or theme. Published monthly September through April; subscription of $5 per year in Canada and $6 per year in the USA. Address communications to the Editor, *Elements*, Department of Elementary Education, 539 Education South.

PREPARATION OF MANUSCRIPTS

1. All manuscripts must be typewritten, double spaced, and submitted in duplicate. An abstract of approximately 100 words in length, typed on a separate page, should be provided.
2. Tables must be numbered in Arabic numerals with the word 'Table' centered and in capital letters, e.g., TABLE 4. The heading of the table is to be centered below and typed in capitals. The format of tables should conform to the specifications in the APA Publications Manual.
3. Graphs and charts should be used only if essential. They must be carefully prepared on separate sheets in India ink, ready for reproduction. Graphs must be properly labelled using Arabic numerals, e.g., Figure 3.
4. Each table or figure should be presented on a separate page. The position of tables and graphs should be clearly indicated within the text by inserting at the relevent point the phrase (Insert Table 2 here).
5. References should appear in parentheses following the reference citing the author's name (unless the name appears in the text), the year of publication, and page number if appropriate. For direct quotations, the reference should be cited and the page number given in brackets before the final punctuation of the quotation. The references should be listed alphabetically by authors' last names at the end of the manuscript under the heading, *References*.
6. Explanatory notes, numbered consecutively and identified in the text with a superscript, may be included under the heading of *Notes*. They should be double spaced and placed at the end of the manuscript immediately preceding the *References*. The citing of references and quotations in the *Notes* should conform to the procedures outlined in No. 5 above.
7. Spelling shall conform to the *Oxford English Dictionary* or to the *Dictionary of Canadian English,* except in the case of direct quotations which must conform to the original. Editorial alterations will be made if necessary.
8. In matters of style, the APA Publications Manual is considered definitive.

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